REV E

SH 1

DWG. NO. 150-045264

APPLICATION		REVISIONS				
NEXT ASSEMBLY	FINAL ASSEMBLY	REV	DESCRIPTION	DATE	APPROVED	APPROVED
		A	Initial Release per DCN W1894	12-19-02	V Wallace	---
		B	Change P/Ns Per DCN W2610	12-23-02	R DuRall	V Wallace
		C	Update Ground Maintenance and Flight Tests sections per DCN W2696	03/06/03	R DuRall	V Wallace
		D	Changes to pages 5, 8, 16, 17, 47, 84, 98, 100, 101, 102, 103, 104, & 108 Per DCN W2752	03/28/03	R DuRall	V Wallace
		E	Changes to ADC, Inst. Panel, and added IDU BKLT and LND GR info. Added helicopter requirements per DCN W2842	05/14/03	R DuRall	V Wallace

APPROVALS	DATE
DRAWN Randy Harper	12-16-02
CHECKED Kevin Compos	12-16-02
ENGINEER Buddy Jackson	12-16-02
ISSUED Vern Wallace	12-19-02

Typed signatures indicate approval. Handwritten signature approval of this document is on file at Wulfsberg Electronics, Prescott, Arizona.

Wulfsberg Electronics
A Chelton Group Company

SYSTEM INSTALLATION INSTRUCTIONS

SIZE	CAGE CODE	DWG NO.	REV
A	1B7G3	150-045264	E

SCALE: NONE

DO NOT SCALE DRAWING

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FLIGHT LOGIC
SYNTHETIC VISION
EFIS

SYSTEM INSTALLATION INSTRUCTIONS

CHELTON
FLIGHT SYSTEMS

Manual Part Number
150-045264
Rev. E

CHELTON
FLIGHT SYSTEMS

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www.cheltonflightsystems.com

CHELTON
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A NOTE FROM CHELTON FLIGHT SYSTEMS...

WELCOME

Congratulations on your acquisition of a Chelton Flight Logic EFIS (Electronic Flight Instrument System).

In the last two decades, aviation has become more and more complex; as a result, cockpit resources have followed the commercial carriers' trend toward **"automation-centered"** systems. These systems try to remove the pilot from the decision-making process and automate control of the aircraft and its systems to the greatest extent possible, thereby relegating the pilot to the role of manager and emergency backup. Examples are Flight Directors and Fly-By-Wire systems.

Your Chelton EFIS, on the other hand, was conceived and designed as a **"pilot-centered"** system. This type of system, common in military tactical applications, presents the pilot with information necessary to make decisions about the flight and take appropriate actions. Contrary to the popular idea of overloading the pilot with information and options, Chelton Flight Systems EFIS products clearly and concisely present ONLY necessary information. This reduces pilot workload, decreases task complexity, and minimizes confusion. The result is safer flying.

Chelton Flight Systems' goal is **IFR-VFR equivalence** and the basic concept of your Chelton EFIS is proven HUD symbology overlaying a real-time 3-D virtual reality view of the outside world. The resulting **"synthetic vision"** provides the IMC pilot with the simple visual clues for navigation and aircraft control as those used in VFR conditions. This **"virtual VFR"** eliminates the need to scan multiple instruments for aircraft control or mentally interpret complicated enroute and approach procedures. As you gain experience with your Chelton EFIS, you will fly with more precision, awareness, and comfort than you ever thought possible.

REVISION HISTORY

System Installation Instructions, Document 150-045264

Date	Revision	Software Version
12/19/02	A	v4.0E
12/23/02	B	v4.0E
03/06/03	C	v4.0E
03/28/03	D	v4.0F
05/14/03	E	v4.0G

Chapter 1

Introduction

ABOUT THIS GUIDE

This guide provides instructions for installing the Chelton Flight Systems EFIS products. Use it for new or retrofit installations. The most recent version of this installation guide is always available online at www.cheltonflightsystems.com.

WARNING!
These instructions are intended for use by installers familiar with standard aircraft avionics practices and methods of installation. If you do not have prior experience with or knowledge of avionics installations, do not attempt the following installation. Chelton Flight Systems will not be held liable for damaged items resulting from improper handling and installation.

You will find the stylistic elements listed in **Table 1** used throughout this guide. These styles are used to emphasize text, to make the information more accessible to you during the installation, and to make the online manual more interactive.

This guide includes installation and checkout procedures for the EFIS system to standards described in FAA Advisory Circular 23-1311-1A.

Chapter 1	Provides an **introduction** to the EFIS system to include a description of the EFIS system, parts list and list of special tools required.
Chapter 2	Includes **system installation** and checkout procedures.
Chapter 3	Includes **system drawings**, both mechanical and electrical.
Chapter 4	Includes **EFIS configuration** procedures, IDU limits programming, and AHRS calibration.

Chapter 5 Includes **ground functional test** procedures.

Chapter 6 Includes **flight functional test** procedures.

Table 1. Installation Guide Style Conventions

Style	Description	Uses
1. Tasks	Numbered steps that together form a set of instructions for installing a specific EFIS component.	The numbered task guides you through the proper sequence of installation procedures.
Checklists ☐	Installation procedures with checkboxes beside them. All the procedures in the checklist must be performed, but do not need to be performed in a specific order.	The checklist will help you track your installation progress. Write a checkmark in the checkbox after you complete each procedure.
 ***WARNING!***	A graphical icon with an explanation point in the center, followed by bolded text with red boarders.	This warning icon is used to flag important installation considerations. Failure to heed the information in the warnings could cause bodily harm, damage to the aircraft, or damage to the EFIS product.
Audible Message 	A speaker icon followed by descriptive text shaded in grey.	The speaker icon denotes an audible tone produced by the EFIS.

UNPACKING THE EFIS

System components are shipped in packaging designed to protect the components during transit. Carefully unpack and identify each component using the list on page 8 and 9. Check the contents of the package against the packing list in the box. Visually inspect each individual component for any signs of damage.

Keep all shipping containers and packaging in case you need to return any items. Contact Chelton Flight Systems immediately if you find missing or damaged components. Before returning anything, please contact Chelton Flight Systems by one of the means below.

Phone: (208) 389-9959
Fax: (208) 389-9961
E-mail:support@cheltonflightsystems.com

You must file a claim for a damaged product within 48 hours of receiving the equipment.

Most of the items required for installation are supplied in the original package from Chelton Flight Systems. You may order supplemental items (not included in the package) from Chelton Flight System separately to further aid the installation process.

SPECIAL TOOLS

In addition to a standard aircraft mechanic's tool set, you will need crimp tools and locators that meet MIL specification M22520. These tools will ensure consistent, reliable crimp contact connections. If you do not have these specialized tools, contact Chelton Flight Systems for sourcing information. Refer to **Table 2** below for specifications.

Table 2. Special Tools Parts List

Tool Description	Part Number
Insertion Tool	ITT part#274-7048-000 (Desc. CIET-22D-01)
Crimp Tool (HD)	ITT part#995-0001-584 (Desc. M22520/2-01)
Locator Tool	ITT part#995-0001-244 (Desc. M22520/2-07)
Locator Tool (HD)	ITT part#995-0001-739 (Desc, M22520/2-06)
Locator Tool (HD)	Desc. M22520/2-09

You should also have the following tools and supplies on hand:

- Loctite® 242 Medium Strength Threadlocker for sensors and probes.
- A digital multimeter for testing internal terminators on cable assemblies, and for testing voltage of various outputs.
- A laptop computer with Crossbow AHRS "GyroView" software installed.

SYSTEM DESCRIPTION

The Chelton Flight Systems EFIS system is a complete flight and navigation instrumentation system that intuitively provides information to a pilot via computer generated screen displays. The screen displays are a three-dimensional, enhanced vision Primary Flight Display ("PFD") and a Multi-Function Display ("MFD") that can be configured to show a moving map, an HSI, traffic, terrain, TAWS or weather displays.

PFD

MFD

The EFIS system consists of various discrete digital sensor modules that communicate with the Integrated Display Units ("IDU") via RS-232, RS-422 or ARINC-429 serial data. The EFIS (Minimal IFR) system will have one set of "required" digital sensor modules for AHRS, GPS, AIU, and two digital sensor modules for ADC, with optional sensors (i.e. Stormscope®, TCAD) communicating to one-four IDUs. Each IDU is independent from all other IDU's. In an IFR (2, 3, 4 IDU) installation, the software of the primary IDU will be configured so that only the PFD Screen can be displayed. The

software of all other IDUs will be configured so that any screen display can be shown at any time.

The EFIS IDU also provides an integrated visual and auditory caution / warning / advisory system that monitors a wide variety of parameters (essential, non-essential, advisory) and provides auditory annunciations for conditions that demand pilot attention. Aural annunciations take the form of either a voice warning or a high / low-tone warble. Aural warnings are accompanied by a red flag and repeat until acknowledged by the pilot or the condition is corrected. Aural cautions are accompanied by an amber flag and are only annunciated once. Advisories may be accompanied by an amber or green flag, depending on condition, and are indicated by either a voice annunciation or warble.

SYSTEM CONFIGURATION

Each display is driven by its own internal processor. A complete system consists of at least two IDUs, one AHRS, one ADC, and one GPS receiver. All IDUs communicate with (but do not rely upon) each other and all sensors are connected to the IDU in parallel, so each IDU is independent from all others and (except for the PFD) can show any display page at any time. The data transfer between components, along with the additional equipment that can be interfaced with the EFIS are indicated in the following block diagram.

The systems may be configured with a backup battery on an essential bus to provide power in the event of an electrical system failure. In addition, various component failure modes are automatically handled by the software and annunciated to the pilot both visibly and audibly.

AUDIBLE MESSAGE
The messages listed in the "Audible Message" column of Table 3 are all annunciated by the system in the case of a component failure.

Table 3. System Failure Warnings

Failed Component	Displayed Message	Audible Message
GPS	NO GPS XX:XX	"GPS failure, GPS failure"
ADC	NO AIR DATA	"Air Data failure, Air Data failure"
AHRS	NO ATTITUDE	"Attitude failure, Attitude failure"
TCAD	NO TCAD	Warble
WX-500	NO WX-500	Warble

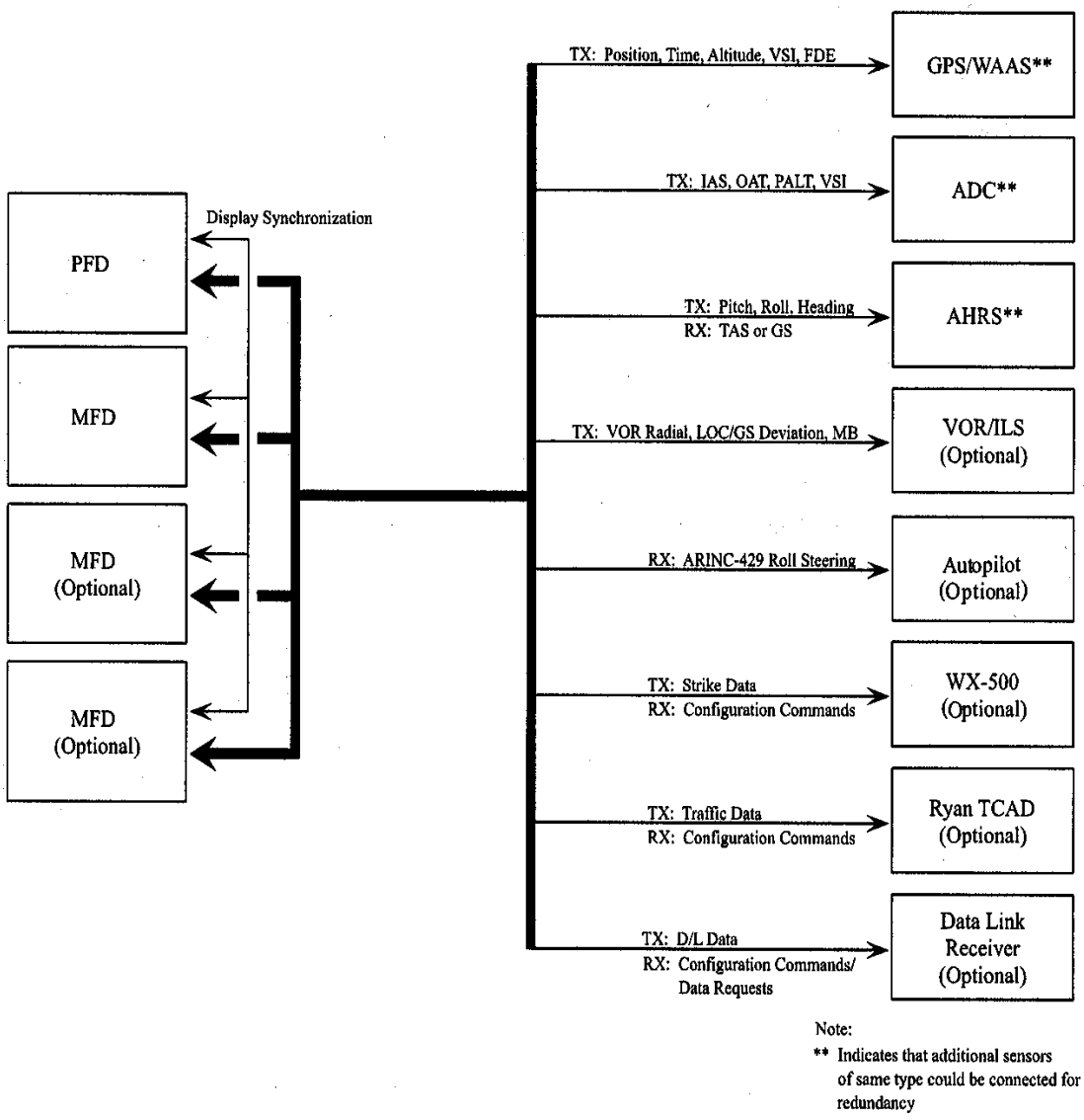


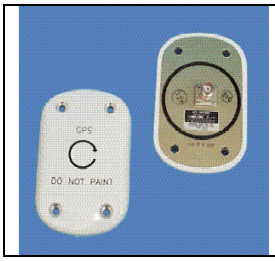
Figure 1 Block Diagram EFIS System

SYSTEM COMPONENTS AND SPECIFICATIONS

The table below describes each component of the system along with physical, electrical, and placement specifications. The components are grouped according to how they are packaged

Table 4. System Components and Specifications

Component	Description	Part No.	Specifications		
			Dimensions	Weight	Power
	Integrated Display Unit (IDU)	401-045500-0101	6.30”w 5.50”h 3.25”d	4.6 lbs.	12-34VDC 1.4 Amps
	Slip Indicator (IDU)	310-045600-01	3.00”w 0.75”h 0.40”d	0.1 lbs.	N/A
	Non-slip bezel (IDU)	146-045520-01	3.00”w 0.75”h 0.40”d	0.1 lbs.	N/A
	Tray Assembly	401-045515-02 401-045515-03 401-045515-04 401-045515-05	6.25”w 5.50”h 5.22”d	1.4 lbs.	N/A
	System Config. Card (SCC)	310-045626-01 310-045628-01 310-045629-01 310-045630-01	1.75”w 1.25”h	0.1 lbs.	5 VDC
	Air Data Computer (ADC)	962830A-1-S-8	3.4”w 3.5”h 6.3”d	1.25 lbs.	14-28 VDC 1.3 Amps
	Attitude Heading and Reference System (AHRS)	8350-0062-01	4.66”w 4.863”h 5.909”d	4.6 lbs	9-30 VDC 0.14 Amps
	Global Positioning System (GPS/ WAAS)	84100-01-02xx	4.13”w 1.60”h 6.50”d	0.8 lbs.	12-28 VDC 0.25 Amps

	GPS Antenna	81194	3.0”w 0.5”h 4.7”d	0.375 lbs.	5 VDC (from sensor)

NOTE: *Small parts and electrical components required for installation that are not specifically called out in the parts list, shall meet the requirements for aerospace use as “acceptable parts” or “standard parts”. Selection of these parts shall be in accordance with guidance provided in FAA Advisory Circular 20-62D, dated 5/24/96 (or later revision).*

OPERATIONAL WARNINGS

The following is a summary of all warnings contained in this manual. Caution messages relate to aspects of the system that the pilot MUST be aware of to ensure proper, safe operation.

DO NOT FLY WITH YOUR CHELTON FLIGHT SYSTEMS EFIS IF YOU DO NOT FULLY UNDERSTAND EACH CAUTION LISTED BELOW:

WARNING!
DO NOT START ENGINE WITH AHRS OPERATING. LOW VOLTAGE CAN CAUSE ERRONEOUS INITIALIZATION.

WARNING!
ACTUAL HEIGHT ABOVE GROUND CAN BE SIGNIFICANTLY LESS THAN THE ESTIMATED AGL INDICATION.

WARNING!
ACTUAL TERRAIN CAN BE HIGHER THAN INDICATED

WARNING!
AHRS MUST BE STATIONARY DURING AND FOR 10 SECONDS AFTER POWER UP.

WARNING!
GPS ERRORS CAN EXCEED 300 METERS UNDER EXTREME CONDITIONS.

ACRONYMS AND ABBREVIATIONS

The following abbreviations and acronyms are used extensively throughout this document and in the system's user interface.

Table 4. Acronyms and Abbreviations

AGL	-	Above Ground Level
AHRS	-	Attitude/Heading Reference System
ALT	-	Altitude
AOA	-	Angle Of Attack
APT	-	Airport (reference point)
AUX	-	Auxiliary
CDA	-	Climb/Descent
CDI	-	Course Deviation Indicator
CFS	-	Chelton Flight Systems
CLR	-	Clear
CPU	-	Central Processing Unit
CWA	-	Caution/Warning/Advisory
DA	-	Decision Altitude
DH	-	Decision Height
DISP	-	Display
EFIS	-	Electronic Flight Instrument System
ETA	-	Estimated Time of Arrival
ETE	-	Estimated Time Enroute
FAA	-	Federal Aviation Administration
FAF	-	Final Approach Fix
FAR	-	Federal Aviation Regulation
FDE	-	Fault Detection and Exclusion
FIS	-	Flight Information Service
FL	-	Fuel
FLF	-	Fuel Flow
FLP	-	Flight Plan
FPM	-	Feet Per Minute
GPH	-	Gallon Per Hour
GPS	-	Global Positioning System
GS	-	Ground Speed
HDG	-	Heading
HG	-	inches of mercury
HSI	-	Horizontal Situation Indicator
IDU	-	Integrated Display Unit

Table 4. Acronyms and Abbreviations (continued)

IFR	-	Instrument Flight Rules
ILS	-	Instrument Landing System
IMC		Instrument Meteorological Conditions
KIAS	-	Knots Indicated Airspeed
KT	-	Knot – Nautical Mile
KTAS	-	Knots True Airspeed
LOC	-	Localizer
LRU	-	Line Replaceable Unit
MFD	-	Multifunctional Display (an IDU with software for showing multiple display screens)
MIN	-	minimum
MSL	-	Mean Sea Level
NM	-	Nautical Mile
OAT	-	Outside Air Temperature
PFD	-	Primary Flight Display
RPM	-	Revolutions Per Minute
SEL	-	Select
SPD	-	Speed
TCAD	-	Traffic/Collision Avoidance Device
TCAS	-	Traffic/Collision Avoidance System
TEMP	-	Temperature
TERR	-	Terrain
TGT	-	Target
VFR	-	Visual Flight Rules
VOR	-	VHF Omnirange
VSI	-	Vertical Speed Indicator
WAAS	-	Wide Area Augmentation System

Chapter 2

System Installation

A successful installation should begin with careful consideration and planning of mounting locations, cable routing, and any associated airframe modifications that may be required.

WARNING!
It is critically important for you to read this installation guide completely and thoroughly before starting component installation and wiring.

PRE-INSTALLATION INFORMATION

Always follow good avionics installation practices per FAA Advisory Circulars 43.13-1B, 43.13-2A, and AC 23-1311-1A or later FAA approved revisions of these documents.

Detailed instructions on mounting IDUs, sensors, and antennas can be found on drawings:

150-045010 Instrument Panel Layout
150-045011 IDU Installation
150-045050 System Antenna Installation
150-045051 Remote Sensor Installation

Detailed wiring diagrams are found on drawings:

702-045250 EFIS IDU Interface
702-045251 Aircraft System Interface

Detailed instruction on wire harness termination for the IDU connectors is found on drawing:

100-045242 EFIS Cabling and Termination Process

Installation of the EFIS system uses one or more of the following installation kits:

149-045264-01	PFD
149-045264-02	MFD
149-045264-03	Dual Sensor Option

Follow the installation procedure in this chapter as it is presented for a successful installation. Read the entire chapter before beginning the procedure. Perform the post installation checkout before closing the work area in case problems occur.

Complete an electrical load analysis on the aircraft prior to starting modification to ensure the aircraft has the ability to carry the EFIS load. Refer to Table 4 for the power consumption of each component. Record the aircraft load on FAA Form 337.

INSTALLATION OVERVIEW

Installation will typically follow these steps, which are explained in detail later in this chapter:

1. Perform a pre-mod avionics system check to verify that all systems are functioning properly

2. Perform a pre-mod pitot/static leak check to verify that the pitot and static plumbing are secure.

3. Determine the appropriate location for the EFIS components and make any necessary airframe modifications.

4. Remove the pilot's and co-pilot's (if applicable) instrument panel.

5. Modify the pilot's and co-pilots (if applicable) instrument panels.

6. Install the ADC unit(s).

7. Install pitot and static plumbing.

8. Install the Temperature Probe(s).

9. Install the Fuel Flow Transducer.

10. Install the GPS unit(s).

11. Install GPS antenna(s).

12. Temporarily install the AHRS sensor(s).

13. Test the EFIS system.

14. Finalize the AHRS installation

15. Perform a Weight and Balance.

16. Configure the EFIS software (see Chapter 4).

17. Ground Functional Test

18. Flight Functional Test

INSTALL THE EFIS SYSTEM

Task 1. Pre-mod Avionics Systems Check

Perform a pre-modification avionics systems check. Verify that all systems are functioning properly I/A/W the applicable aircraft maintenance manuals. If any discrepancies are noted, generate the appropriate paper work and record these discrepancies.

Task 2. Pre-mod Pitot/Static Leak Test

A Pitot and Static Leak test is performed to verify that the pitot and static lines and fittings are secure so the airspeed (pitot) and altimeter (static) indications will be accurate.
Perform a pre-maintenance pitot/static leak test using 1000 FT (AGL) altitude and 50 KTS airspeed and record the results I/A/W the applicable aircraft maintenance manuals.

Pitot leak rate _____KTS per min. at _____KIAS.

Static leak rate _____FPM at _____FT.

Task 3. Determine the Location of the PFD, MFD, and Required Backup Instruments

The PFD and MFD must be installed within easy reach of the pilot or co-pilot.

The required mounting location for the PFD is:

- Between eye-level and 40° below eye-level vertically
- ±30° laterally

The required mounting location for the MFD is:

- Between eye-level and 40° below eye-level vertically
- ±70° laterally

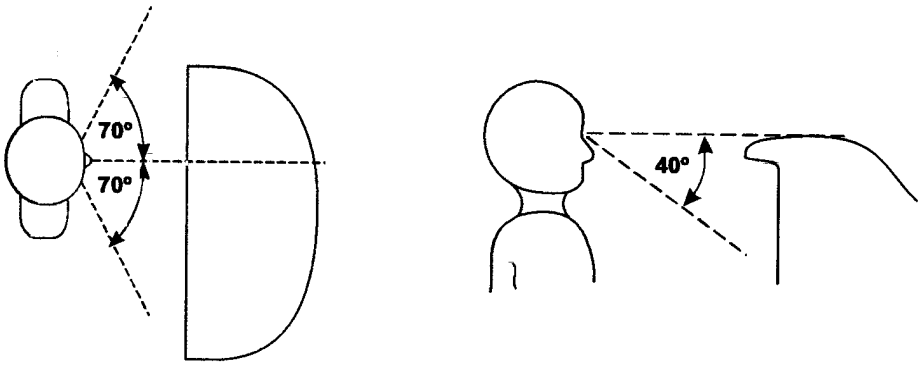


Figure 1 **Optimal IDU location**

Fixed wing aircraft

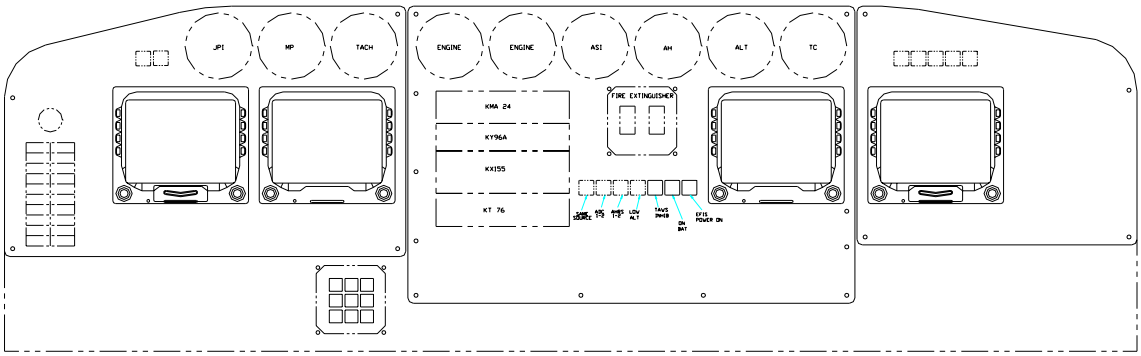


Figure 2 Typical single PFD and multiple MFD installation, aircraft (C-441)

The CFS EFIS-SV installation requires a backup vacuum attitude, standard airspeed, and standard altimeter instruments. The optimal installation would place the attitude instrument next to the PFD with airspeed and altimeter arranged near the attitude indicator.

In most applications, the IDU will be located near the top of the instrument panel, below the glare shield, and directly in front of the pilot. The IDU utilizes back-lit, active matrix, LCD technology and, like all LCD's, will exhibit a certain amount of graphic degradation as viewing angles increase.

Helicopter (Bell 206)

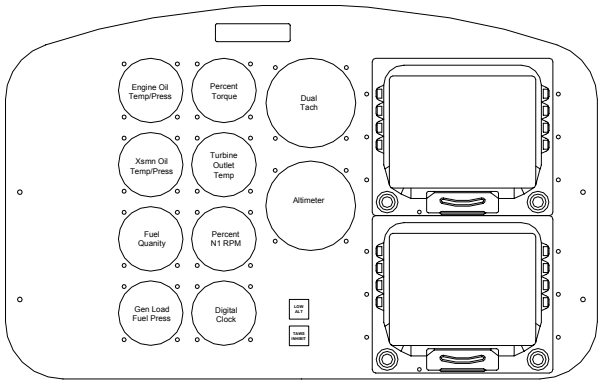


Figure 3 Typical single PFD and MDF installation, helicopter (Bell 206)

Part 27 helicopter installations for VFR require a standby altimeter. Flight critical engine instrumentation must remain in the original orientation and be mounted as close to the IDUs as possible.

It will be necessary to increase the tilt of the instrument panel to reduce IDU screen degradation. This is accomplished by modifying the lower attach bars to increase the panel tilt by 7° towards the pilot.

Be sure to allow room behind the IDU for the cable connector and a 6 to 12 inch service loop in the cable.

Cooling

Generally, the IDU needs no special cooling considerations, although it is advisable to protect the screens from prolonged direct UV exposure when the aircraft is parked outside. If the operating ambient air temperature is greater than 120º F, it is recommend that you add a small (1.0 inch) SCAT tubing that will direct cooled air toward the back of the device.

WARNING!
The IDU is thermally protected. Continuous operation of the EFIS in ambient air temperature exceeding 120º F may cause the IDU to temporarily shut down due to internal thermal protection.

Task 4. Remove Instrument Panel(s)

Remove pilot's instrument panel I/A/W applicable aircraft manufacturers' maintenance manuals to facilitate modification and installation of the IDU.

If applicable, remove the co-pilots and or center instrument panel I/A/W applicable aircraft manufacturers' maintenance manuals to facilitate modification and installation of the IDU.

Task 5. Modify Instrument Panel(s)

Make the cutout for the IDU(s) using the drawing in chapter 3. Use the cutting tools and technique appropriate for the material of the

panel. Refer to drawing 150-045010 for instrument panel requirements.

Task 6. Install IDU Mounting Tray(s)

Fabricate mounting brackets for the IDU tray using drawing 150-045011 as a guide. Using the IDU Mounting tray as a template, locate, drill and countersink the 4 mounting holes for the tray mounting brackets on the instrument panel. Ensure the IDU mounting tray is level with respect to the aircraft waterline. Secure the IDU tray assembly with four #8 screws and nuts.

Determine the position of each tray (PFD, MFD #1, etc.) and install the appropriate Software Configuration Card (SCC) in the tray with two 4-40x 0.25", 3/32" hex head screws. Use Locktite® 242 to secure screws. The SCC association is defined as:

IDU	SCC
PFD	1
MFD No1	2
MFD No2	3
MFD No3	4

Task 7. Install IDU Cable Assemblies

Fabricate the IDU cable assemblies as shown in the wiring diagrams in Chapter 3 and drawing 702-045250.

- Connect the cable assembly to J2 of the IDU Tray. Route the wiring to the circuit breaker panel. See wiring diagram in Chapter 3 and drawing 705-045250
- Connect the cable assembly to J3 of the IDU Tray. Route the wiring to the appropriate sensors. See wiring diagram in Chapter 3 and drawing 702-045250
- Connect the cable assembly to J5 of the IDU Tray. Route the wiring to the appropriate sensors. See wiring diagram in Chapter 3 and drawing 702-045250.

- Connect one end of the Interconnect cable assembly to J4 of the PFD Tray and the other end to J3 of the MFD or J4 of the MFD to J3 of another MFD (if applicable). See wiring diagram in Chapter 3 and drawing 702-045250.

WARNING!
Ensure that a 6 to 12 inch service loop in the cable assemblies is installed behind the IDU Mounting Tray as the wiring is routed.

Task 8. Install Air Data Computer (ADC)

In considering the location, keep in mind that the ADC 2000 requires signals from the fuel flow, the OAT probe, and the pitot and static lines. Determine the best location of the ADC by inspecting the aircraft to minimize the amount of wire and lines needed for the installation. The recommended mounting procedures for the ADC 2000 are:

A dry temperature stable location with enough distance from motors, pulse generating equipment, relays and cables carrying high DC or AC current, to avoid interference with the low level signals of the OAT probe and fuel flow. Refer to drawing 150-045051 for installation requirements.

NOTE: *Make sure that the ADC is not the lowest point in the pitot and static system, to reduce the chances of collecting moisture or water in it. Form a water trap if necessary.*

Task 9. Install ADC Cable Assembly

Fabricate the ADC Cable assembly using the wiring diagram in Chapter 3. If the EFIS system interfaces with a single ADC, route the ADC interface cable from PFD J3 to ADC J1. If the EFIS system interfaces with dual ADCs, construct wire harnesses from the ADC to the Remote Switching unit per Chapter 3. Connect the ADC cable assembly to J1 of the ADC. Route the wiring to the appropriate location. See wiring diagram in Chapter 3 and drawing 702-045250.

NOTE: *In a dual ADC installation, the left power output will be used to power all fuel flow transducers. Route the left power output from both ADCs to the switching box as shown in drawing 702-045250.*

Task 10. Connect to Pitot and Static Lines

The pitot and static lines should be cut and a tee installed, to tap into these lines. Ensure new static system connections are placed after the alternate static source valve. Use appropriate type fittings to match the type installed in the aircraft. Use approved practices in installing these lines and perform a leak check before returning the aircraft to service. For dual ADC installations, if two pitot and static sources are available, connect the ADC's to different pitot and static sources.

Task 11. Mounting the OAT Probe

Refer to the Shadin Drawing 4012-177 supplied in the OAT Probe Assy Kit 681201A-1. Use the supplied stiffener to support the probe.

- The sun shield must be installed for proper operation of the OAT probe.
- For single engine installations, avoid mounting the OAT probe on the belly of the aircraft to avoid erroneous readings due to the presence of hot exhaust gases.
- Splice the red and black wires to the appropriate wires from the ADC 2000 cable assembly. See wiring diagram in Chapter 3 and drawing 702-045250.

Task 12. Install Fuel Flow Transducer

The Fuel Flow Transducer shall be installed using the acceptable methods, techniques and practices as defined in AC 43.13-1B (Chapter 8, Section 2, Par 8-31). See drawing 702-045251 for additional wiring information.

- Transducer should be installed at least 1 foot from fuel pump, and normally on the suction side of the pump. The transducer will be installed before any fuel bypass loops.

- Install transducer with wire leads pointed UP to vent any entrained air bubbles and to ensure that the rotor is well immersed in liquid.

- For maximum accuracy, the transducer should be mounted level (horizontal).

- If not already installed, a screen or filter should be placed upstream of the transducer to screen out debris which could effect rotor movement or settle in V-bearings.

- Provide an unobstructed "straight section" length of 6" to 12" upstream of the transducer to prevent turbulence.

- Ensure the fuel flow transmitter(s) K-factor is properly programmed in the ADC per Shadin document IM2830-A1S8, Section 10.

Task 13. Install GPS Sensor

Install the GPS Sensor in a location as close to the GPS Antenna as is practical. This reduces the signal loss that occurs in the antenna cable.

- Allow approximately 6 inches free space in front of the connectors for the proper bend radius of the coax cable.

- Locate and drill the mounting holes using the drawing in Chapter 3 and drawing 702-045250. Refer to drawing 150-045051 for installation requirements.

Task 14. Install GPS Sensor Cable Assembly

Fabricate the GPS Cable assembly are identified by a label near the connector. The label will state GPS 1 or GPS 2.

- If the EFIS interfaces with a single GPS receiver, locate the GPS interface cable from PFD J1 and terminate at GPS J1 per Chapter 3 or drawing 702-045250.

- If the EFIS interfaces with dual GPS receivers, fabricate cables from each GPS to the Remote Switch unit per Chapter 3 and drawing 702-045250.

Task 15. Install GPS Antenna

The GPS antenna is vertical polarized, optimized for UHF operation, and designed for installation in aircraft, including helicopters. The GPS is a line of sight system. This means that the antenna must have an unobstructed view of the target. Any "shadowing" or signal shading from the aircraft will degrade the performance of the GPS. Shadowing may be from vertical stabilizers, wings, other antennas, engines, propellers, or the fuselage itself. Proper antenna location and installation is very important for the reception of the signals. Install the GPS Antenna on top of the fuselage using the drawing in Chapter 3. Refer to drawing 150-045050 for mounting requirements of the antenna in pressurized aircraft, otherwise install the antenna per FAA AC43-13.1B §4-58 and FAA AC43-13-2A, chapter 3.

- Use RG-400 coax cable or equivalent.

- To minimize shadowing by other aircraft structure, the GPS Antenna should be located on the top center forward portion of the fuselage. An optional location is on the turtle deck aft of the cockpit.

- Communication, Satcom and TCAS transmitter frequencies are in a near frequency band relationship with the receive frequency of the GPS Sensor. Therefore maximum reasonable separation between the GPS Antenna any other antenna(s) should be maintained.

NOTE: *The minimum separation between the GPS and other antennas is 48 inches. Any installation with less than 48 inches separation will need to be evaluated for possible interference. In multiple installations there should be a minimum separation of 12 inches between GPS Antennas.*

Task 16. Prepare a Location for the AHRS

WARNING!
In order for the AHRS to function properly in a tubular steel fuselage aircraft, you must completely degauss the airframe prior to AHRS installation.

WARNING!
The AHRS is a highly sophisticated and delicate electronic instrument. Use extreme caution when handling it during installation. Because of the magnetic sensitivity of the AHRS instrument, it is mandatory for the AHRS to be temporarily mounted in the proposed location first. Do not mount it permanently until after successfully testing the entire system for electrical interface with other equipment.

Selecting the location for the AHRS is a two-step process.

- The first step is to find a "desired" or "proposed" location based on a set of mounting criteria. (See AHRS mounting checklist.)

- The second step is to finalize the mounting location after all other equipment is installed and operational, and you have verified that no magnetic or vibration effects are present.

Most aircraft can accommodate the AHRS behind the aft cabin bulkhead. Whether you want to place the AHRS there, or elsewhere, the location for the AHRS must comply with the following environmental specifications.

AHRS MOUNTING CRITERIA CHECKLIST

If you have any doubt concerning the AHRS location suitability, please contact your Chelton Flight System technical representative (by phone at (208) 389-9959, or visit our website at www.cheltonflightsystems.com).

❑ **Location and proximity to IDU.**

AHRS can be mounted inside or outside of the pressure vessel. Use GyroView software to determine best location of AHRS by selecting the Navigation Window and viewing the heading deviations as systems around the AHRS are activated, deactivated, and operated throughout their functions. A good location will not display more than a 2° heading change when all systems are operated. Systems can include operation of flaps and landing gears, and engines.

Dual installations must be mounted in the same location.

NOTE: *Do not secure or permanently place the cable until you have completed all the steps below.*

❑ **Mounting structure**
Find a rigid mounting location that will alleviate potential vibration errors induced from normal airframe vibration (engine, control surfaces, etc.). Refer to drawing 150-045051 for mounting requirements.

❑ **Distance from metallic objects**
The AHRS must not be located within 24 inches of any large, moving, ferric metal objects such as landing gear components, motors, or linkage. Keep in mind any metallic objects that may change position between ground operations and flight operations, such as landing gear, flap actuators, and control linkages. Static ferric objects, however, can be compensated with internal bias offsets. See the AHRS compass calibration procedures in Chapter 4.

❑ **Orientation**

- The unit must be level on the yaw and roll planes of rotation when the aircraft is in a straight and level flight attitude. Level per airplane manufacturer's maintenance instructions.

- The ideal location of the AHRS is as close to the pitch and roll axes as possible. When faced with a decision between the two, it is better for the AHRS to be near or on the roll axis.

- The pitch axis must be set parallel to the wing's angle of incidence (usually 3 to 5 degrees positive from the fuselage lubber line).

Task 17. Voice Warning System (VWS)

The VWS is compatible with any unswitched, non-amplified mono audio input to an auxiliary input of an audio panel or intercom system.

VWS INSTALLATION CHECKLIST

- ❑ **Install the VWS wiring as directed by the audio panel or intercom manufacturer's documentation to the un-muted audio input.**
- ❑ **Run a separate wire for the remote-mounted mute switch.** This switch is a "momentary on" switch (push-to-talk or PTT) and generally located on the control column or other convenient location, as it must be accessible by the pilot during all phases of flight. The switch is labeled "MUTE".
- ❑ **Wire and install the mute switch according to the wiring diagram.**
- ❑ **Secure wires to the airframe using wire wraps or equivalent.**
- ❑ **Ensure that all connectors and plugs are assembled, connected, and secure.**

Task 18. EFIS Switches and Annunciations

The EFIS installation kit contains SPDT toggle switches for TAWS INHIBIT, ADC 1/2, AHRS 1/2, and GPS 1/2. The installer has the option of using Eaton or Korry annunciators and annunciated switches. Refer to Field Service Notice: EFIS-II Installation for manufacturers and part numbers of annunciators/switches and associated hardware.

Refer to drawing 150-045010 for guidance on locations of the switches and annunciators.

If installed, wire all required switches, annunciators, terminal blocks, and diode modules per drawing 702-045250 and 702-045251 for the equipment being installed.

The optional EFIS annunciators and annunciated switches can be wired into the existing aircraft annunciator dimming circuit if applicable. The dimming requirements are as follows:

Bus Voltage	Bright Voltage	Dim Voltage
28VDC	28VDC	11VDC
14VDC	14VDC	5.1VDC

If no existing dimming circuit is available, use drawing 702-045251 for the dimming circuit.

Task 19. Backlighting and Landing Gear

IDU BACKLIGHTING

The EFIS IDUs can accept external screen dimming from the existing aircraft instrument panel dimming circuit. The IDU will operate on 5-30VDC backlighting.

The BACKLIGHT REFERENCE VOLTAGE input is connected to the maximum dimming voltage that will be used. This voltage can be supplied by the aircraft avionics bus, or the input voltage to the aircraft dimming circuit.

The BACKLIGHT CONTROL input is connected to the output of the aircraft dimming circuit. The ratio between the BACKLIGHT REFERENCE VOLTAGE and BACKLIGHT CONTROL inputs will determine the proper level of IDU screen backlighting.

NOTE: *The IDU automatically determines proper screen backlight level on initial power-up. For this function to operate, the BACKLIGHT REFERENCE VOLTAGE must be at 0VDC. If the BACKLIGHT REFERENCE VOLTAGE into the IDU is above 2VDC, the IDU will use the external backlighting circuit to determine screen backlighting.*

NOTE: *Most aircraft instrument panel backlighting circuits output 0VDC when in the "DAY" (or BRIGHT) position. For these installations, a DPDT DAY/NIGHT switch will be required to remove bus power from the BACKLIGHT REFERENCE VOLTAGE pin on the IDU during "DAY" operations. Refer to drawing 702-045250 for switching option.*

LANDING GEAR DISCRETE

Landing gear input is required for Class-"A" TAWS, but can be displayed on the PFD under the Flight Path Marker for any configuration. The IDU requires a ground input as a "Down and Lock" condition. For those aircraft that produce a signal other than ground, refer to drawing 702-045251 for reverse logic wiring.

Task 20. IDU Installation

The slip or non-slip housing will be installed on the IDU prior to mounting in the rack. The installer will determine which housing is to be installed on the IDU. The slip housing will be installed on the IDU that is directly in front of the pilot. An optional slip housing can be installed on the IDU that is directly in front of the co-pilot if applicable. The slip and non-slip housings are installed with two 4-40x 0.125" countersink screws on the bottom of the bezel. Use Locktite® 242 to secure screws.

Install the IDU in the rack until it stops. Insert a 3/32" hex driver in the lower left-hand hole on the bezel and rotate clockwise until the IDU is fully seated. The IDU will be flush with the instrument panel. Do not over tighten the mounting screw.

Removal of the IDU is performed by inserting a 3/32" hex driver in the lower left-hand hole on the bezel and rotate counter-clockwise until the IDU stops moving away from the instrument panel. Take the IDU by its sides and slide the unit completely out of the tray.

Task 21. ARINC-429 Interface

WORD ORDERING

The ARINC-429 word order is as follows:

SSM LSB	Normal Data Portion of 429 Data Word																		SDI or Data		SSM		Parity Status	Label							
29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	31	30	32	1	2	3	4	5	6	7	8

TRANSMIT

The following words are transmitted on Com21 (low speed) and Com22 (High speed):

Label (ARINC-429 Names)	Equip Code	Format & Units	Range	Sig. bits	Min Delay (ms)	Notes
101 Selected Heading	002	BNR Degrees Magnetic	+/-180	12	31.3	Set to heading (mag) when no bug is set. (1)
114 Desired Track	0x002	BNR Degrees True	+-180	12	100	(1)
115 Waypoint Bearing	0x002	BNR Degrees Magnetic	+/-180	12	31.3	Set to heading if no waypoint. (1)
116 Cross Track Distance	0x002	BNR NM	128	15	31.3	(1) (2)
121 Horizontal Command Signal		BNR Degrees	+/-180			(3)
203 Pressure Altitude	0x006, 0x018, 0x038	BNR Feet	131072	17	20	(1)
251 Distance to Go	0x001, 0x002	BNR NM	4096	15	100	(1) (2)
310 Present Position – Latitude	0x002, 0x004	BNR Degrees	+/-180	20	100	(1) Data portion of word uses SDI field as well.
311 Present Position – Longitude	0x002, 0x004	BNR Degrees	+/-180	20	100	(1) Data portion of word uses SDI field as well.
312 Ground Speed						Fail_mode != 0, 1, 2, 3, or 6 sets SSM to “Failure Warning”
313 Track Angle	0x004	BNR Degrees True	+/-180	15	25	(1)
314 True Heading	0x004	BNR Degrees True	+/-180	15	25	(1)

320 Magnetic Heading	0x004	BNR Degrees Magnetic	+/-180	15	25	(1)
326 Lateral Scale Factor	0x002	BNR NM	128	15	80	

RECEIVE

TEST THE EFIS

Task 1. Power Up the System

Power the system up and ensure that it is functioning properly, with all input sources (GPS, ADC and AHRS) providing information to the IDU.

NOTE: *The ADC requires 90 seconds from application of power before it sends a valid data bit. The warm-up time will increase if unit temperature is colder than 75ºF (20ºC).*

As the system powers up, you should hear a warble tone generated by the voice warning system. If any component signals are not being received, warning flag will be displayed on the IDU, and the voice warning system will inform you which components are missing.

POWER UP CHECKLIST

- ☐ **Make sure that the ADC is receiving power and that all associated sensors are active.**
- ☐ **Make sure that the GPS is receiving power and signal.**
- ☐ **Make sure that the AHRS is receiving power.**

The aircraft may need to be outside of the hanger to receive GPS signal.

Task 2. Test the Altitude Output of the ADC

- Rotate the right hand IDU control knob to increase or decrease the barometric pressure readout. Note that the altitude displayed on the IDU increases or decreases correspondingly with this input.

- Set the altitude bug on the IDU (BUGS menu) to the displayed altitude of the EFIS. Increase or decrease the baro scale via the right-hand IDU control knob to more than 150 feet of the selected altitude. The voice warning function should alert you with "ALTITUDE, ALTITUDE" over the intercom system of the aircraft.

Task 3. Test the AHRS Output

Physically move the AHRS unit or rock the aircraft wings. Note that the heading and attitude changes on the IDU primary display. If there is no heading reference movement, check power to the AHRS, check for the "NO ATTITUDE" warning on the screen, check the pins on the IDU, and check grounds.

Task 4. Test the GPS Output

Locate the aircraft to allow the GPS antenna access to the satellites. Access the **Faults** menu from the MFD. Verify the following are displayed:

- GPS PWR OK GPS receiver power
- GPS EQPMNT OK GPS receiver and antenna

FINALIZE THE AHRS INSTALLATION

WARNING!
AHRS must be OFF during engine start or expensive AHRS damage may result.

WARNING!
The AHRS is a highly sophisticated and delicate electronic instrument. Use extreme caution when handling it during installation. Test the AHRS with all equipment/accessories on and the engine running prior to final installation.

Task 1. Secure the AHRS Wiring

The AHRS must be mounted clear of any wiring bundles, strobe lines, comm. Antennas, or anything that may cause magnetic or electrical interference. Secure the wiring allowing access and movement of the AHRS unit.

Task 2. Permanently Mount the AHRS

Secure the AHRS Unit to the airframe being careful to install all of the shims that were required to level on the yaw and roll planes of rotation when the aircraft is in a straight and level flight attitude.

WEIGHT AND BALANCE

The removal and addition of equipment results in changes to the aircraft center of gravity. After all of the equipment and wiring is completely installed and secured, a weight and balance procedure should be performed in accordance with FAA AC 43.13-1B, Chapter 10 and/or FAA-H-8083-1.

FINAL CONFIGURATION NOTE

After the entire EFIS is installed and wired, certain components require specific configuration in order as follows:

1. After installation is complete and while flight testing the aircraft, note the displayed attitude from the PFD while in level flight. If the horizon line is shown too high, the AHRS must be tilted “nose

up" a corresponding amount to bring the horizon line to the center of the screen.

NOTE:
Typically, the waterline symbol should be 2º to 3º above the horizon line in straight and level flight.

2. Carefully shim the AHRS with brass washers as needed.

3. Likewise, if the PFD page shows a slight bank when the aircraft is in level flight, shimming may be required. Typically, the horizon line of the PFD should be near the center of the display when the aircraft is loaded with its typical payload. Once set, a discernible difference in aircraft attitude will be noticed throughout the range of airspeed, weight, and angle of attack combinations.

NOTE TO RESELLERS
Keep track of this location as reference for future installations in identical aircraft models. Keep in mind, however, that because of differences in construction, electrical equipment, placement of electrical wiring, and other variables, this location may not work in another seemingly identical aircraft. Complete the installation test described above for each and every AHRS installation.

Chapter 3

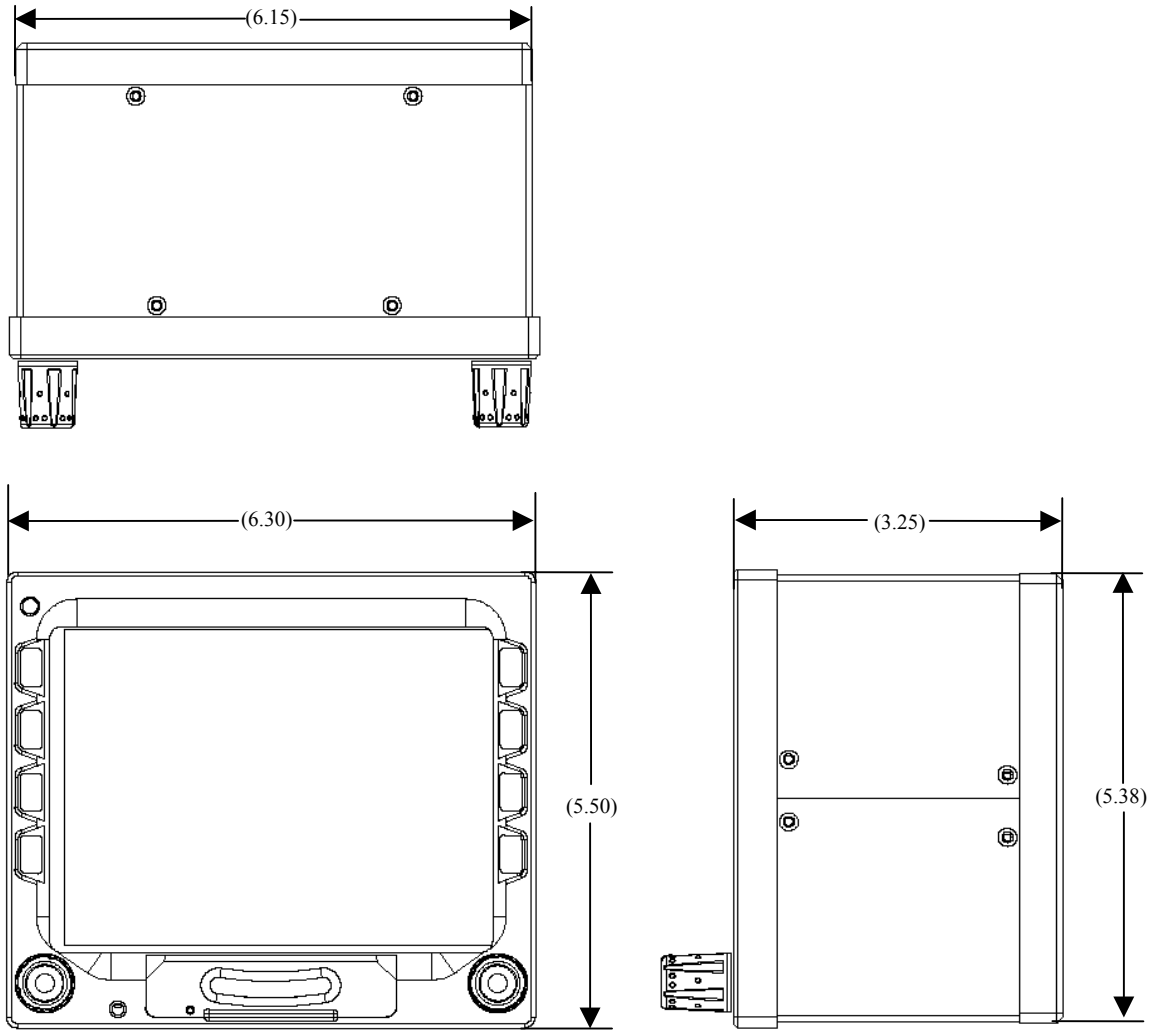
System Drawings

This chapter contains the mechanical and electrical drawings for the EFIS system. Additional drawings can be found in the appropriate vendor Installation Manuals.

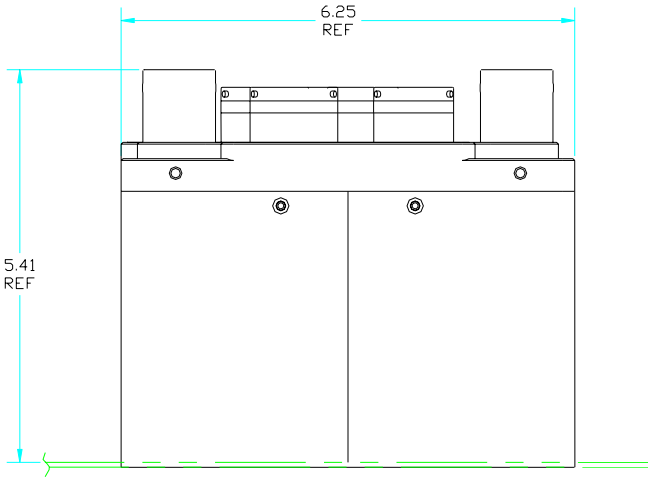
Drawings:

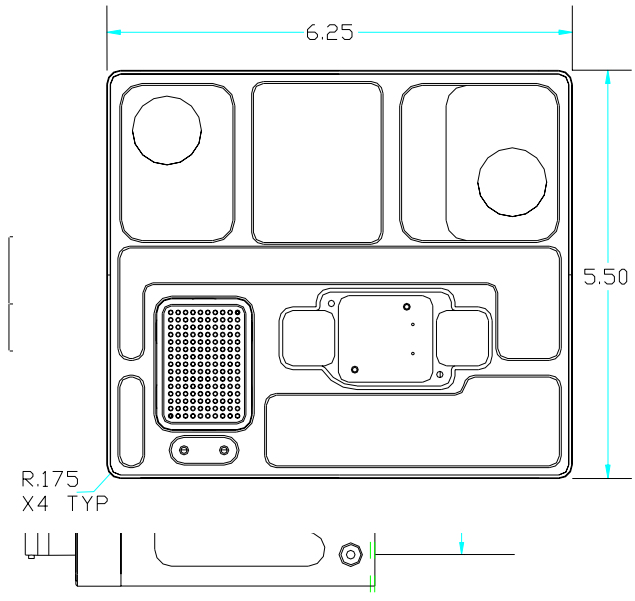
WARNING!
The drawings in this guide are for reference only and do not include all required information to install the system on an aircraft. Refer to the drawings listed in Chapter 2, Pre-Installation Information.

3.1 IDU MECHANICAL DRAWING

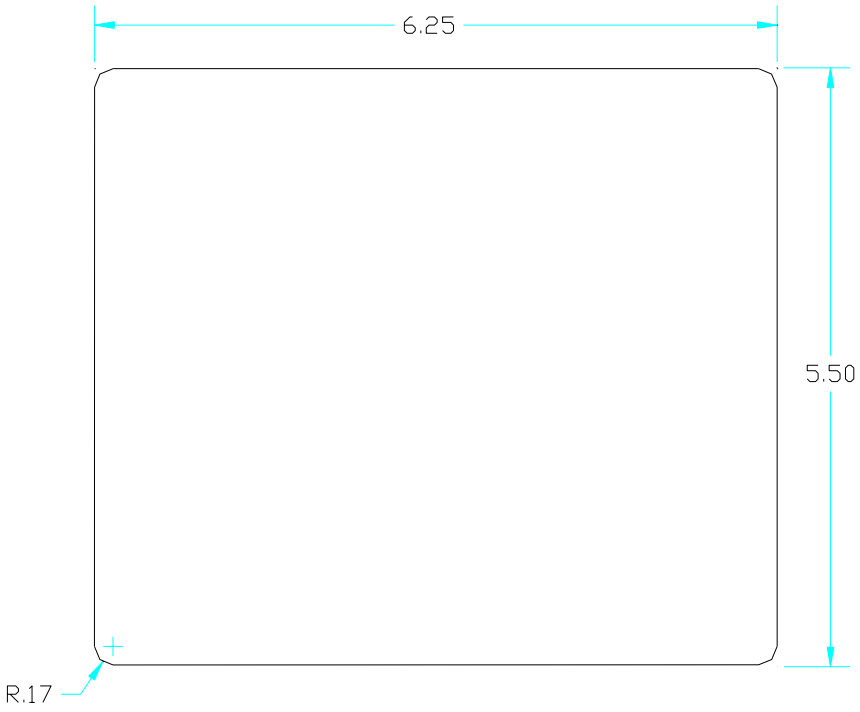


3.2 IDU TRAY MECHANICAL DRAWING

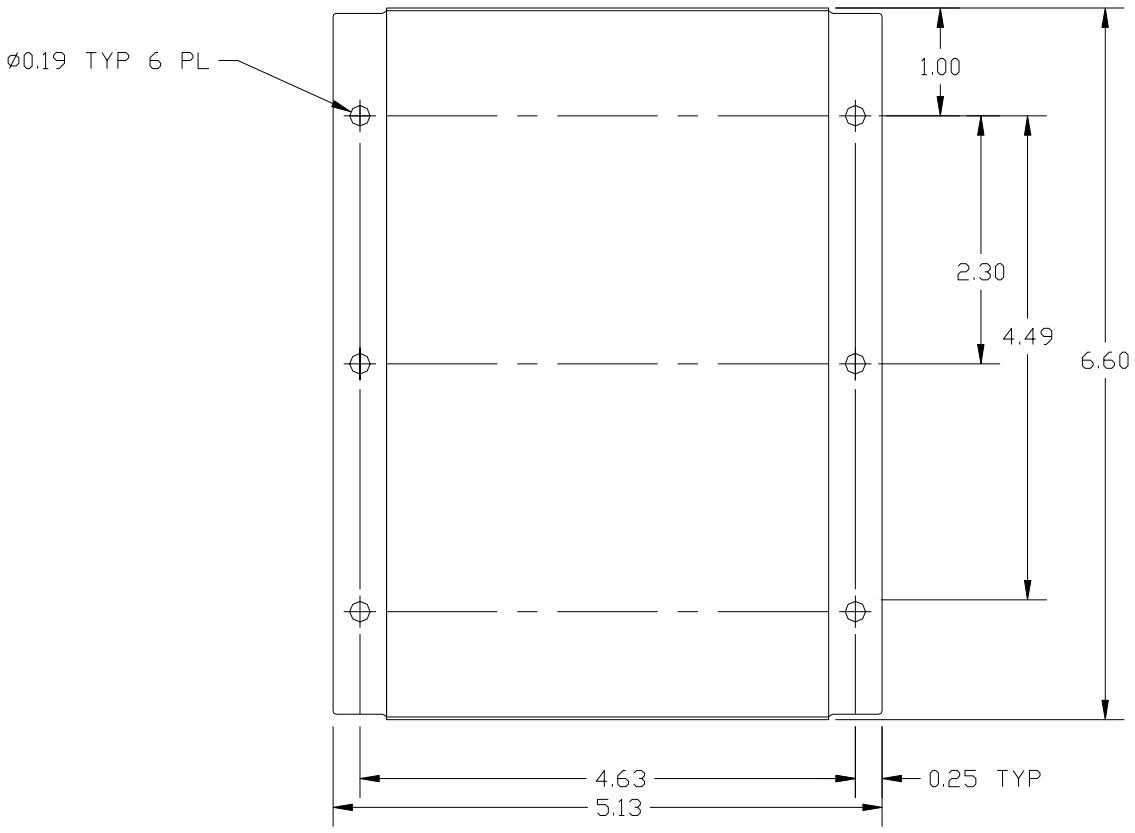


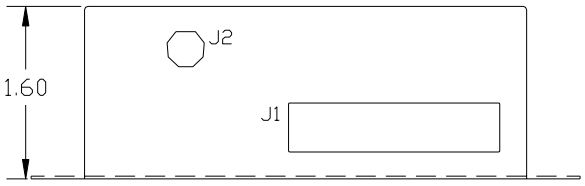


3.3 IDU PANEL CUTOUT DRAWING

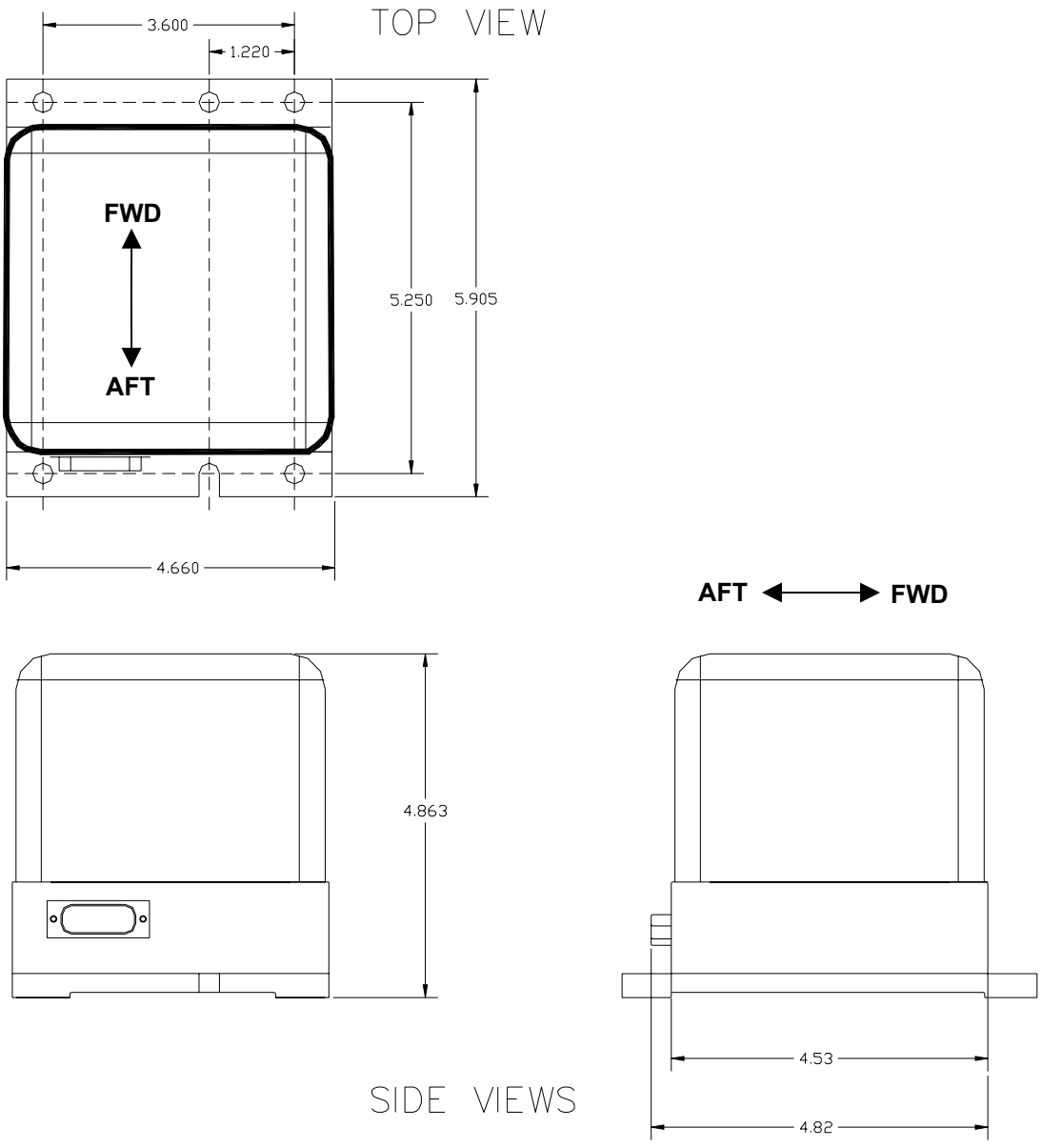


3.4 GPS MECHANICAL DRAWING

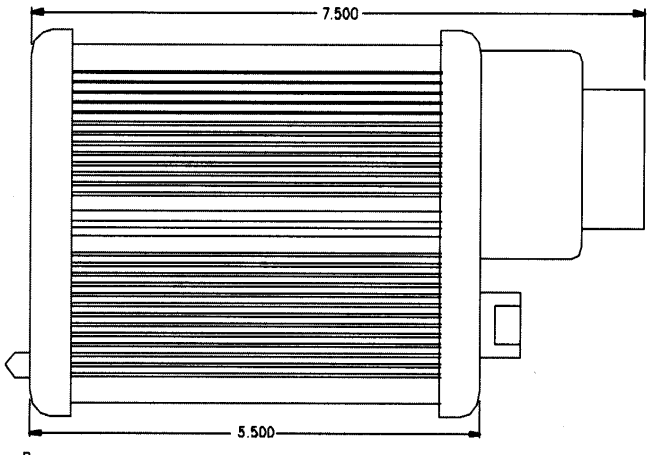




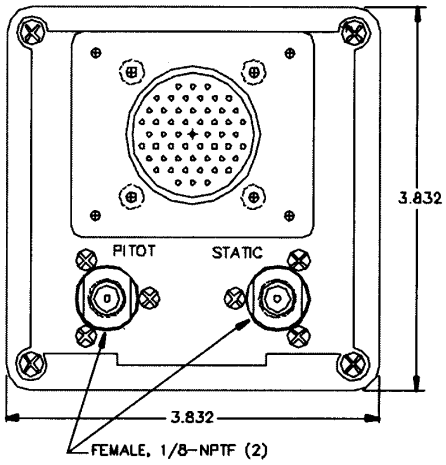
3.5 AHRS MECHANICAL DRAWING



3.6 ADC MECHANICAL DRAWING

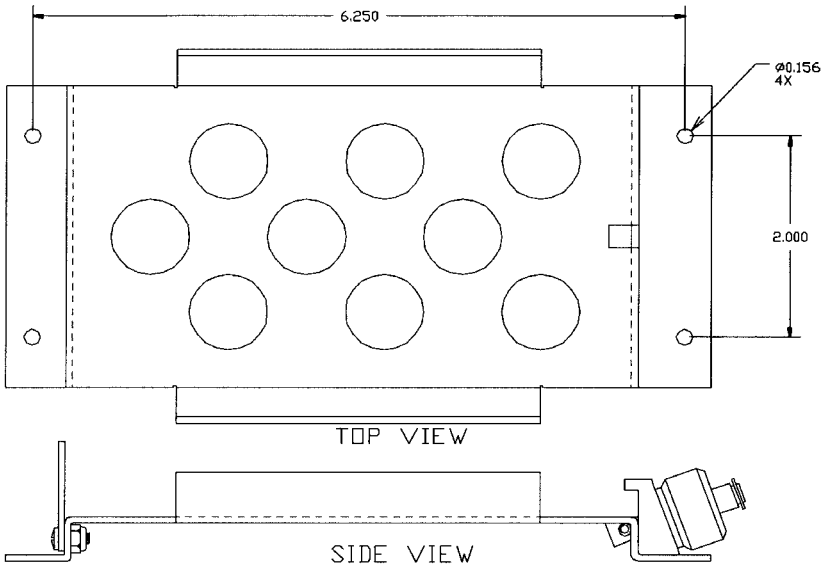


ADC Side View



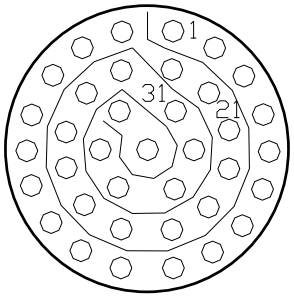
ADC Front View

ADC Mounting Tray



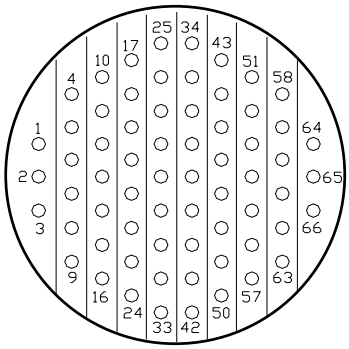
3.7 SYSTEM CONNECTOR PINOUTS

3.7A IDU P2 CONNECTOR



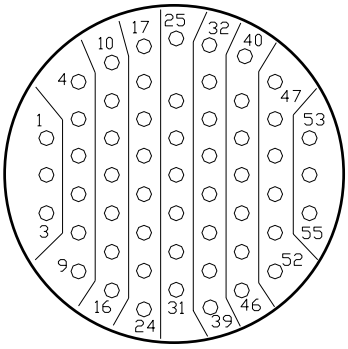
PIN	DESCRIPTION	PIN	DESCRIPTION
1	N/C	20	GROUND
2	N/C	21	GROUND
3	N/C	22	GROUND
4	REMOTE SELECT IN	23	GROUND
5	POWER	24	POWER GROUND
6	POWER	25	POWER GROUND
7	POWER	26	POWER GROUND
8	POWER	27	COM 21 (429) TXB
9	CRT VERTICAL OUT	28	COM 22 (429) TXB
10	CRT BLU OUT	29	COM 23 (429) TXB
11	CRT GREEN OUT	30	COM 24 (429) TXB
12	CRT RED OUT	31	POWER GROUND
13	CRT HORIZONTAL OUT	32	GROUND
14	COM 21 (429) TXA	33	GROUND
15	COM 22 (429) TXA	34	GROUND
16	COM 23 (429) TXA	35	GROUND
17	COM 24 (429) TXA	36	GROUND
18	UPS OUT	37	GROUND
19	GROUND		

3.7B IDU P3/P4 CONNECTOR



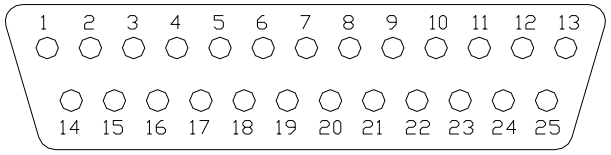
PIN	DESCRIPTION	PIN	DESCRIPTION
1	KEYBOARD POWER (+5V)	34	COM 17 (232) RX
2	KEYBOARD DATA	35	COM 16 (232) RX
3	DISCRETE 05	36	COM 17 (232) GND
4	BACKLIGHT REFERENCE	37	COM 16 (232) GND
5	AUDIO OUT	38	COM 13 (232) GND
6	KEYBOARD CLOCK	39	GROUND
7	DISCRETE 06	40	COM 01 (232) GND
8	DISCRETE 04	41	COM 09 (422) TXA
9	DISCRETE 02	42	COM 09 (422) TXB
10	MUTE IN	43	COM 15 (232) RX
11	BACKLIGHT	44	COM 13 (232) RX
12	5 VDC OUT	45	COM 15 (232) GND
13	AUDIO LOW	46	COM 14 (232) GND
14	KEYBOARD GROUND	47	COM 04 (232) GND
15	DISCRETE 03	48	COM 02 (232) GND
16	DISCRETE 01	49	COM 09 (422) RXA
17	COM 20 (232) RX	50	COM 09 (422) RXB
18	WARNING OUT	51	COM 14 (232) RX
19	COM 20 (232) GND	52	COM 06 (232) TX
20	GROUND	53	COM 06 (232) GND
21	GROUND	54	COM 05 (232) GND
22	GROUND	55	COM 03 (232) GND
23	COM 22 (429) RXA	56	COM 01 (232) RX
24	COM 22 (429) RXB	57	COM 01 (232) TX
25	COM 19 (232) RX	58	COM 06 (232) RX
26	COM 18 (232) RX	59	COM 05 (232) RX
27	COM 19 (232) GND	60	COM 04 (232) RX
28	COM 18 (232) GND	61	COM 03 (232) RX
29	GROUND	62	COM 02 (232) RX
30	GROUND	63	COM 02 (232) TX
31	GROUND	64	COM 05 (232) TX
32	COM 21 (429) RXA	65	COM 04 (232) TX
33	COM 21 (429) RXB	66	COM 03 (232) TX

3.7C IDU P5/P6 CONNECTOR



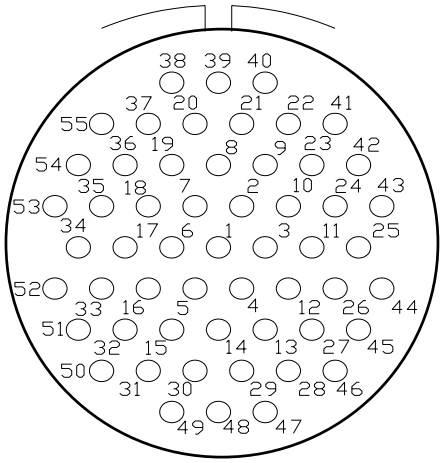
PIN	DESCRIPTION	PIN	DESCRIPTION
1	COM 07 (232) RX	29	GROUND
2	COM 08 (232) TX	30	GROUND
3	DISCRETE 10	31	COM 28 (429) RXB
4	COM 10 (422) TXA	32	COM 11 (422) TXA
5	COM 10 (422) TXB	33	COM 11 (422) TXB
6	COM 07 (232) TX	34	GROUND
7	COM 08 (232) RX	35	GROUND
8	DISCRETE 09	35	GROUND
9	DISCRETE 08	37	GROUND
10	COM 10 (422) RXB	38	N/C
11	N/C	39	COM 27 (429) RXA
12	COM 07 (232) GND	40	COM 12 (422) TXB
13	COM 08 (232) GND	41	COM 12 (422) RXB
14	GROUND	42	GROUND
15	N/C	43	GROUND
16	DISCRETE 07	44	COM 08 (232) GND
17	COM 10 (422) RXA	45	COM 26 (429) RXB
18	COM 11 (422) RXB	46	COM 27 (429) RXB
19	GROUND	47	COM 12 (422) TXA
20	GROUND	48	COM 12 (422) RXA
21	GROUND	49	COM 23 (429) RXA
22	GROUND	50	COM 24 (429) RXA
23	N/C	51	COM 25 (429) RXA
24	COM 28 (429) RXA	52	COM 26 (429) RXA
25	COM 11 (422) RXA	53	COM 23 (429) RXB
26	GROUND	54	COM 24 (429) RXB
27	GROUND	55	COM 25 (429) RXB
28	GROUND		

3.7D GPS P1 CONNECTOR



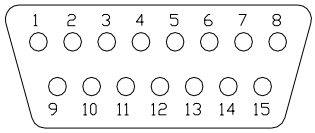
PIN	DESCRIPTION	PIN	DESCRIPTION
1	N/C	14	N/C
2	1 PPS A	15	1 PPS B
3	N/C	16	N/C
4	N/C	17	N/C
5	SHIELD 1	18	SHIELD 2
6	POWER INPUT	19	POWER RETURN
7	RS 232 TX2	20	RS 232 RX2
8	RS 232 TX1	21	RS 232 RX1
9	TX1 COMMON	22	RX1 COMMON
10	TX2 COMMON	23	RX2 COMMON
11	N/C	24	N/C
12	N/C	25	N/C
13	N/C		

3.7E ADC P1 CONNECTOR



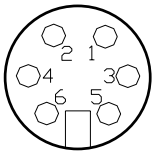
PIN	DESCRIPTION	PIN	DESCRIPTION
1	N/C	29	N/C
2	HEADING Y-SYNC INPUT	30	N/C
3	N/C	31	N/C
4	SHIELD GROUND	32	N/C
5	BARO INPUT +	33	OAT SIGNAL
6	N/C	34	N/C
7	HEADING X-SYNC INPUT	35	HEADING 26 VAC (C)
8	N/C	36	TX RS422 (+)
9	RS232 TX2	37	FLAG (RESERVED)
10	LEFT FF TXDR GROUND	38	RX RS422 (+)
11	N/C	39	RX RS232
12	LEFT DIGITAL FF INPUT	40	ARINC 429 A (+)
13	N/C	41	N/C
14	N/C	42	RX RS232
15	N/C	43	FUEL FLOW POWER
16	BARO INPUT (-)	44	N/C
17	N/C	45	N/C
18	HEADING 26 VAC. H	46	N/C
19	TX RS 422 (-)	47	N/C
20	RX RS422 (-)	48	N/C
21	TX RS232	49	N/C
22	ARINC 429 B (-)	50	N/C
23	RIGHT FF TXDR GROUND	51	N/C
24	RIGHT DIGITAL FF INPUT	52	OAT POWER
25	N/C	53	BARO WIPER
26	FUEL FLOW POWER	54	POWER GROUND
27	N/C	55	12 - 28 VDC INPUT
28	N/C		

3.7F AHRS P1 CONNECTOR



PIN	DESCRIPTION	PIN	DESCRIPTION
1	RS 232 TX	9	SIGNAL GROUND
2	RS 232 RX	10	N/C
3	10-40 VDC POWER INPUT	11	N/C
4	POWER INPUT GROUND	12	N/C
5	N/C	13	SHIELD 2
6	N/C	14	RS 422 RXA (+)
7	RS 422 TXA (+)	15	RS 422 RXA (+)
8	RS 422 TXA (-)		

3.7G KEYBOARD CONNECTOR



PIN	DESCRIPTION	PIN	DESCRIPTION
1	DATA	4	POWER
2	NC	5	CLOCK
3	GROUND	6	NC

3.8 EFIS Wiring Diagram

Wiring Diagrams

Refer to drawings 702-045250 (EFIS Interface) and 702-045251 (Aircraft System Interface) for complete requirements and specifications to the electrical installation of the EFIS system on an aircraft.

Installation Kits

Installation kits will vary depending on the EFIS system installed on the aircraft. The kits are:

149-045264-01 for the PFD
149-045264-02 for each MFD
149-045264-03 for a multi-sensor installation option

NOTE:
All electrical hardware needed for the installation is provided with each kit. The installer will be required to furnish wire, circuit breakers, and fasteners.

NOTES:

(1) UNLESS NOTED OTHERWISE ALL NEW WIRE TO MEET MIL-W22759/16 OR LATER REVISION. ALL WIRE TO BE MIL-C-27500E WITH SHIELDS TYPE (T) AND JACKETS TYPE (14). INSTALL WIRING FOLLOWING CHELTON INSTRUCTIONS PER DOCUMENT 150-045264. FOR ADDITIONAL ROUTING, BONDING AND GROUNDING DETAILS REF: AC43-13-1B CHAPTER 11, SECTIONS 9, 10, 11, & 15.

(2) GROUND NOTES
DC GND — SIGNAL GND
AC GND — AIRFRAME & SHIELD GND
—— XX —— CHASSIS GND

GROUNDS TO BE AS SHORT AS POSSIBLE UNLESS OTHERWISE INDICATED. GROUDNS UNDER 6 INCHES IN LENGTH DO NOT REQUIRE A WIRE NUMBER. SHIELD PREPARATION SHOULD NOT EXCEED 3 INCHES FROM CONNECTOR. SHIELD GROUNDS MAY BE ACCOMPLISHED BY DAISY CHANING. SPLICING OR INDIVIDUALLY GROUNDING SHIELD TO APPROPRIATE GND DEVICE.

(3) RESERVED.

(4) RESERVED.

(5) ALL WIRES 22AWG UNLESS OTHERWISE SPECIFIED.

(6) ---------- DENOTES EXISTING AIRCRAFT WIRING OR COMPONENT.

(7) ---------- DENOTES OPTIONAL EQUIPMENT.

(8) ANNUNCIATED SWITCHES TO BE LOCATED NEAR EFIS INDICATOR.

△9 WARN SIGNAL TYPE TO BE DETERMINED AT TIME OF INSTALLATION. CONNECT WIRING AS NEEDED.

△10 DO NOT CONNECT WIRING TO BOTH SIGNAL TYPES.

△11 OMIT IF SYSTEM IS BEING INSTALLED IN A FIXED GEAR AIRCRAFT.

△12 INSTALL S9501 IN THE PILOTS CONTROL WHEEL.

△13 TERMINATE SHIELDS PER CHELTON DOCUMENT 100-045242.

△14 CONNECT TO EXISTING AIRCRAFT AS SHOWN IN VENDOR MANUAL.

△15 FOR SINGLE ENGINE AIRCRAFT USE LEFT FUEL FLOW INPUT ONLY.

△16 LOW ALT SWITCH IS INSTALLED IN HELICOPTERS ONLY.

△17 GS CANCEL SWITCH IS USED ONLY IN A TAWS CLASS "A" INSTALLATION.

△18 S9505 THRU S9507 AND ASSOCIATED WIRING IS INSTALLED ONLY IF DUAL SENSORS ARE INSTALLED.

△19 INSTALL WIRING ONLY IF DUAL ADC'S ARE INSTALLED.

△20 INSTALL WIRING ONLY IF DUAL GPS'S ARE INSTALLED

△21 TAWS INHIBIT SWITCH TO BE LOCATED NEAR EFIS DISPLAY.

△22 OPTIONAL

△23 LOCATE KEYBOARD CONNECTOR IN A CONVENIENT LOCATION FOR EFIS CHECKOUT AND UPDATING.

△24 REF: W/D AIRCRAFT SYSTEM INTERFACE DWG NO. 702-045251

△25 CONNECT TO EXISTING A/C PANEL LT. REFERENCE AND CONTROL VOLTAGES

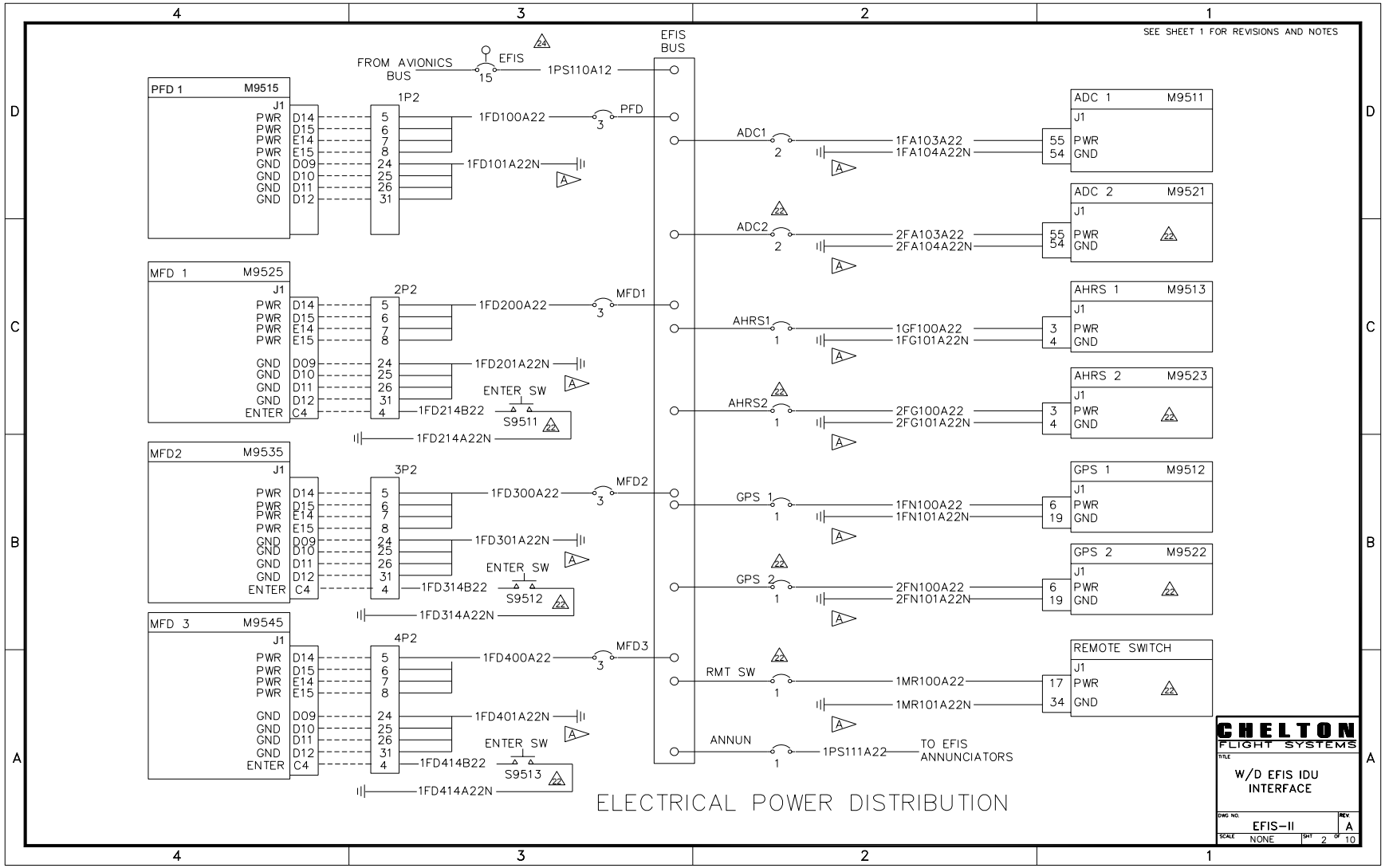
△26 IF DUAL ADC'S ARE INSTALLED, CONNECT THESE WIRES PARALLEL TO NO. 1 ADC FUEL FLOW WIRING.

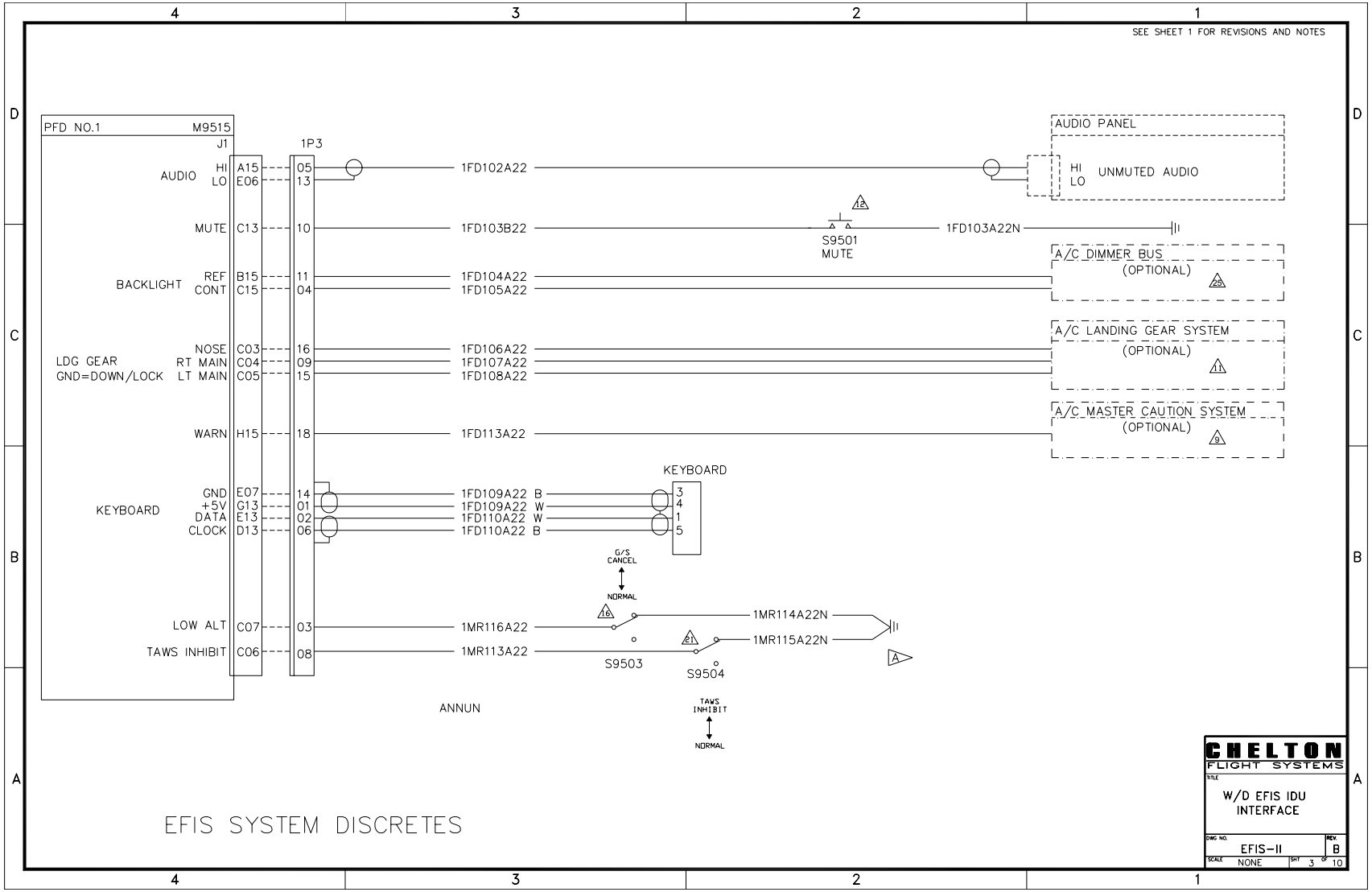
REVISION BLOCK

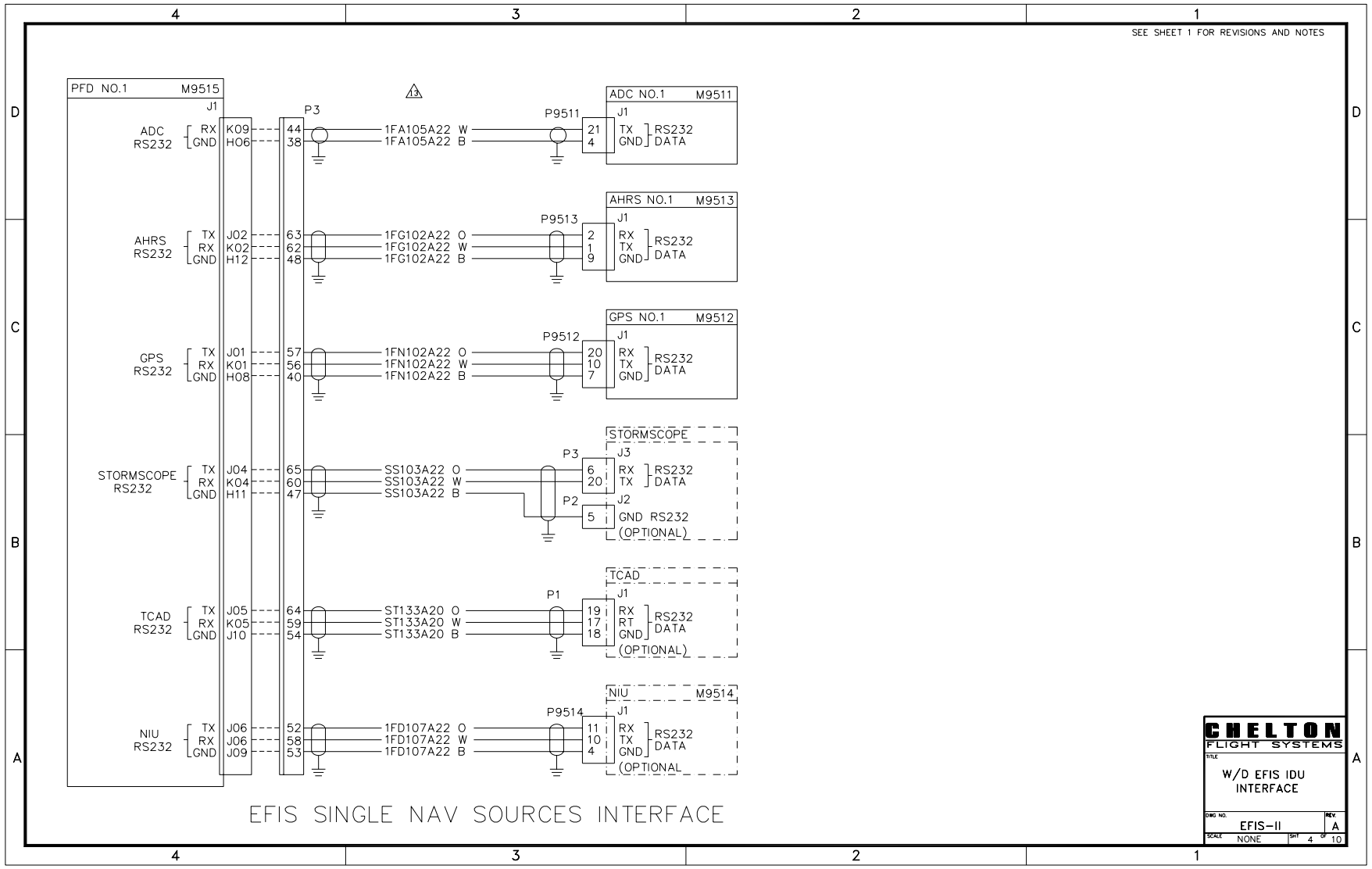
REV.	ZONE	DESCRIPTION	DATE	APPROVED
IR	ALL	INITIAL RELEASE		
A	ALL	WIRE LABEL CORRECTIONS	02/28/03	RAD
B	ALL	EFIS SWITCH CHANGE	04/22/03	RAD

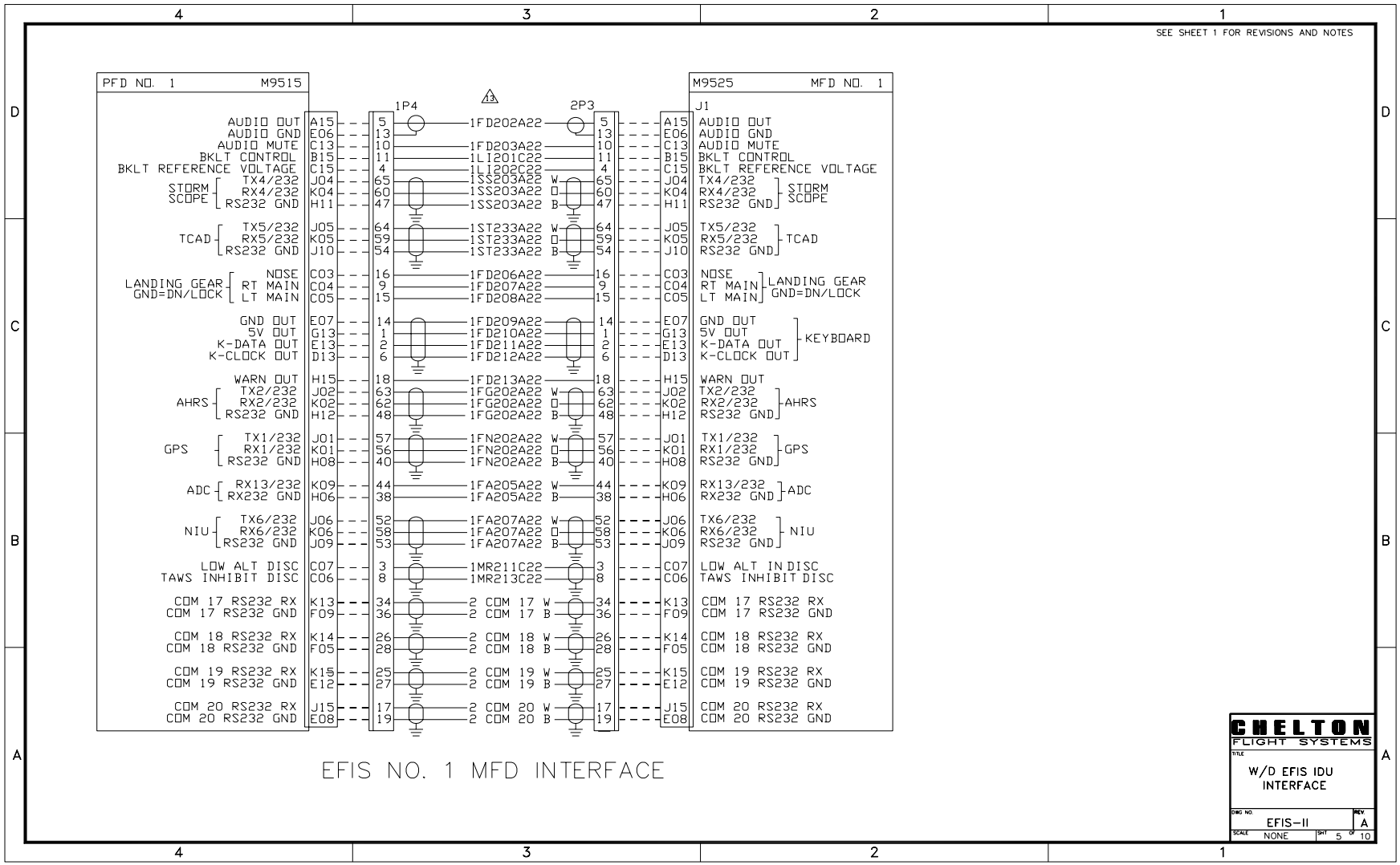
CHELTON FLIGHT SYSTEMS
P.O. BOX 1042
ROME, GA 30161
PH: 706-802-9966
FAX 706-368-8004

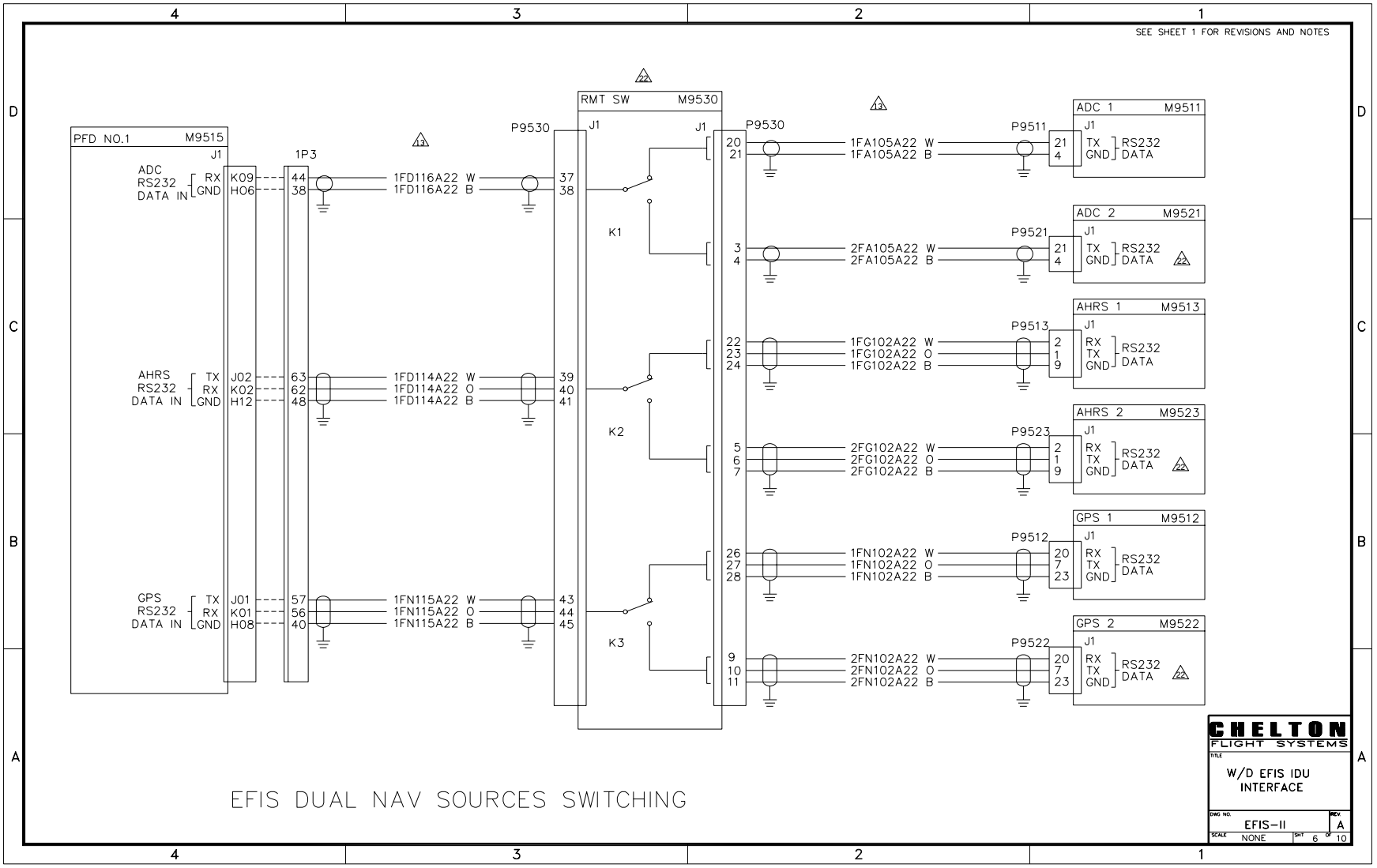
DRAWN	R.DURALL	10/15/02	TITLE: W/D EFIS IDU INTERFACE
GROUP			
CHECK			
PROJ.			
			DWG NO. EFIS-II REV B
MODEL No.:		SERIAL No.: XXX	SCALE NONE SHT 1 OF 10

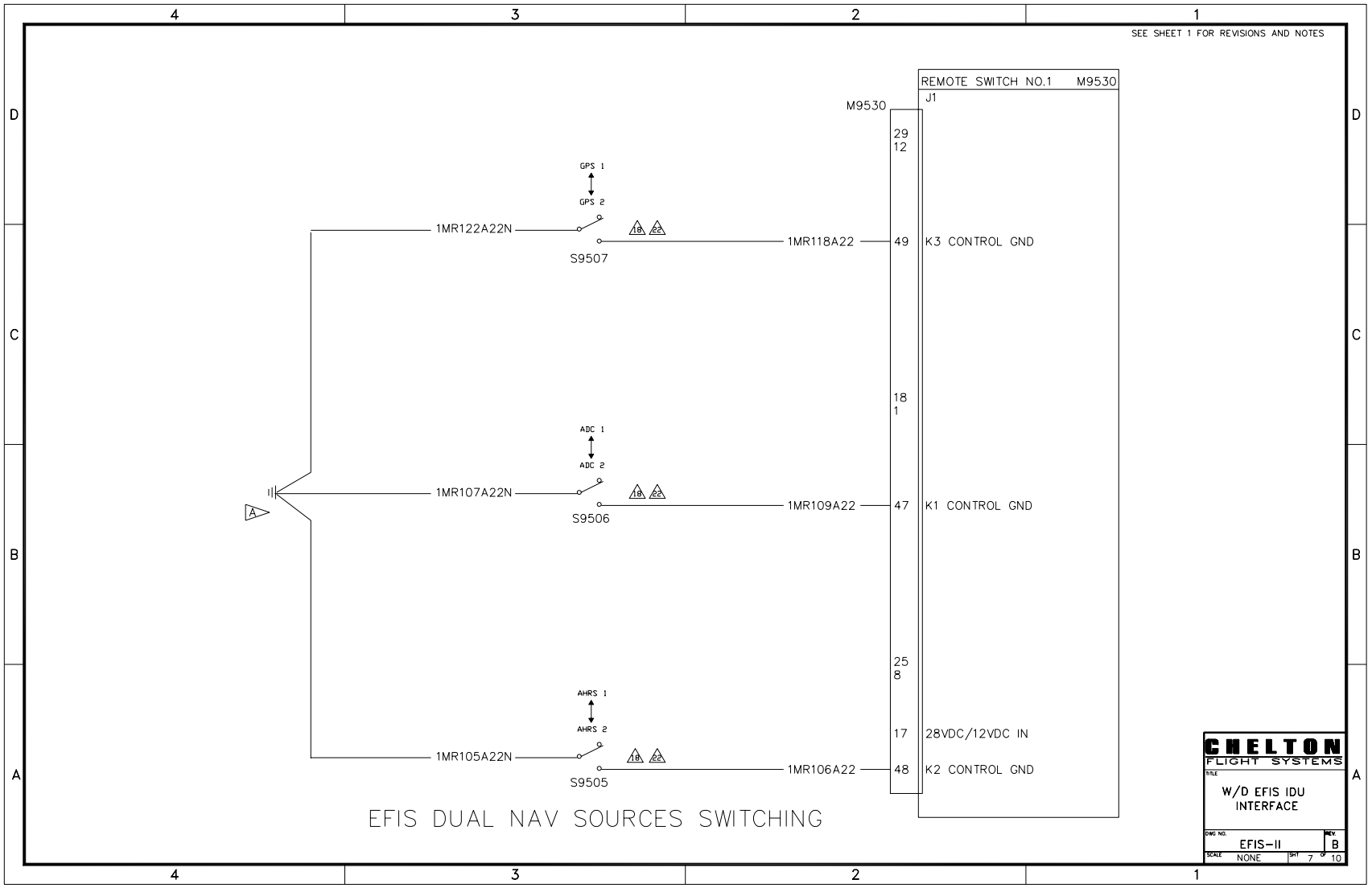

SEE SHEET 1 FOR REVISIONS AND NOTES
EFIS BUS
FROM AVIONICS BUS
EFIS
15
1PS110A12
PFD 1 M9515
1P2
1FD100A22
PFD
1FD101A22N
MFD 1 M9525
2P2
MFD1
1FD200A22
1FD201A22N
ENTER SW
S9511
1FD214B22
1FD214A22N
MFD2 M9535
3P2
MFD2
1FD300A22
1FD301A22N
ENTER SW
S9512
1FD314B22
1FD314A22N
MFD 3 M9545
4P2
MFD3
1FD400A22
1FD401A22N
ENTER SW
S9513
1FD414B22
1FD414A22N
ADC1
1FA103A22
1FA104A22N
ADC 1 M9511
ADC2
2FA103A22
2FA104A22N
ADC 2 M9521
AHRS1
1GF100A22
1FG101A22N
AHRS 1 M9513
AHRS2
2FG100A22
2FG101A22N
AHRS 2 M9523
GPS 1
1FN100A22
1FN101A22N
GPS 1 M9512
GPS 2
2FN100A22
2FN101A22N
GPS 2 M9522
RMT SW
1MR100A22
1MR101A22N
REMOTE SWITCH
ANNUN
1PS111A22
TO EFIS ANNUNCIATORS
ELECTRICAL POWER DISTRIBUTION
CHELTON FLIGHT SYSTEMS
W/D EFIS IDU INTERFACE
DWG NO. EFIS-II
REV. A
SCALE NONE
SHT 2 OF 10

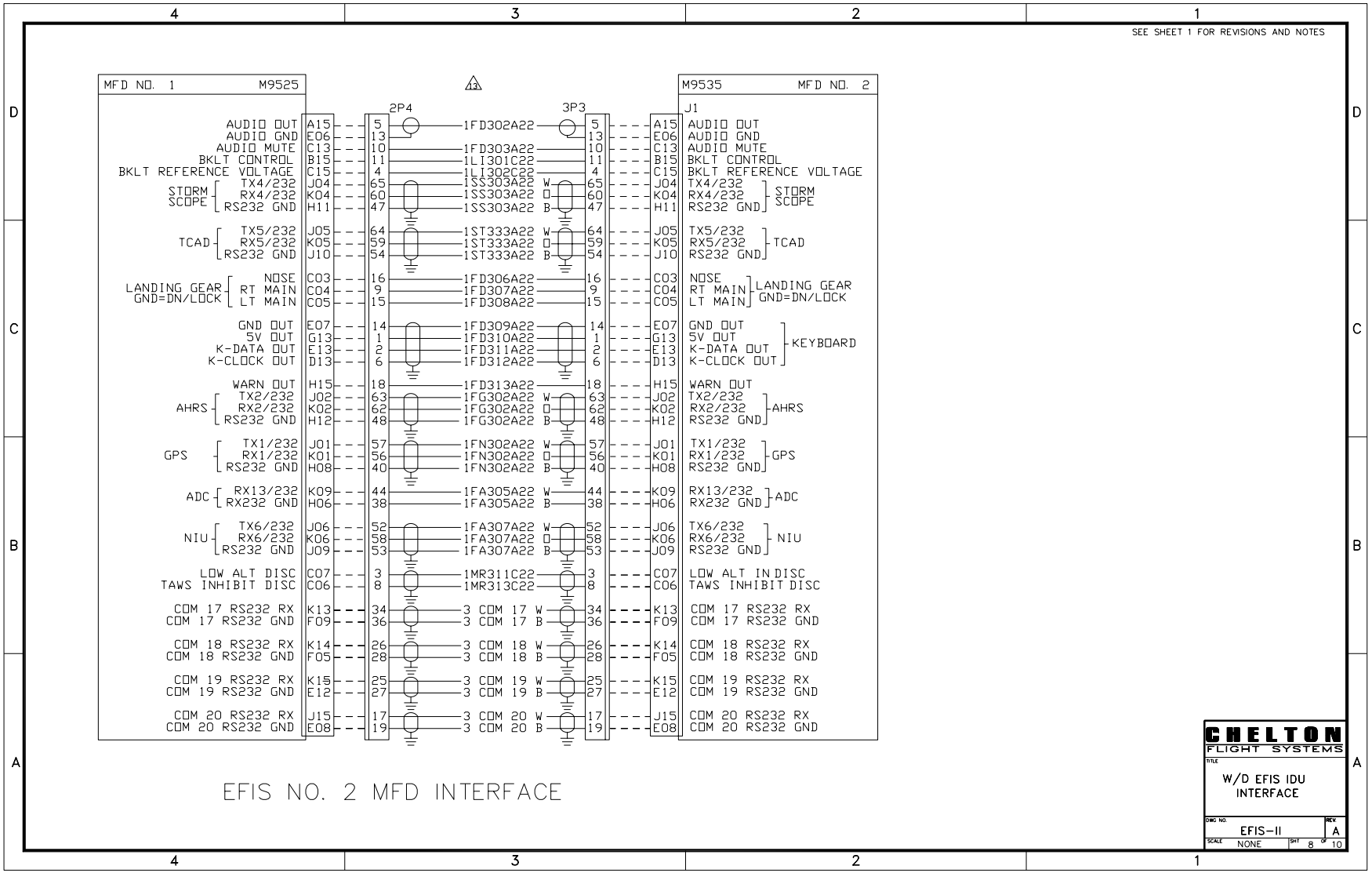

SEE SHEET 1 FOR REVISIONS AND NOTES
PFD NO.1
M9515
J1
1P3
AUDIO HI A15 05 1FD102A22
LO E06 13
AUDIO PANEL
HI
LO
UNMUTED AUDIO
MUTE C13 10 1FD103B22
S9501
MUTE
1FD103A22N
BACKLIGHT REF B15 11 1FD104A22
CONT C15 04 1FD105A22
A/C DIMMER BUS
(OPTIONAL)
LDG GEAR
GND=DOWN/LOCK
NOSE C03 16 1FD106A22
RT MAIN C04 09 1FD107A22
LT MAIN C05 15 1FD108A22
A/C LANDING GEAR SYSTEM
(OPTIONAL)
WARN H15 18 1FD113A22
A/C MASTER CAUTION SYSTEM
(OPTIONAL)
KEYBOARD
KEYBOARD GND E07 14 1FD109A22 B
+5V G13 01 1FD109A22 W
DATA E13 02 1FD110A22 W
CLOCK D13 06 1FD110A22 B
G/S CANCEL
NORMAL
LOW ALT C07 03 1MR116A22
1MR114A22N
TAWS INHIBIT C06 08 1MR113A22
1MR115A22N
S9503
S9504
ANNUN
TAWS INHIBIT
NORMAL
EFIS SYSTEM DISCRETES
CHELTON
FLIGHT SYSTEMS
W/D EFIS IDU
INTERFACE
EFIS-II
B
NONE
3 OF 10

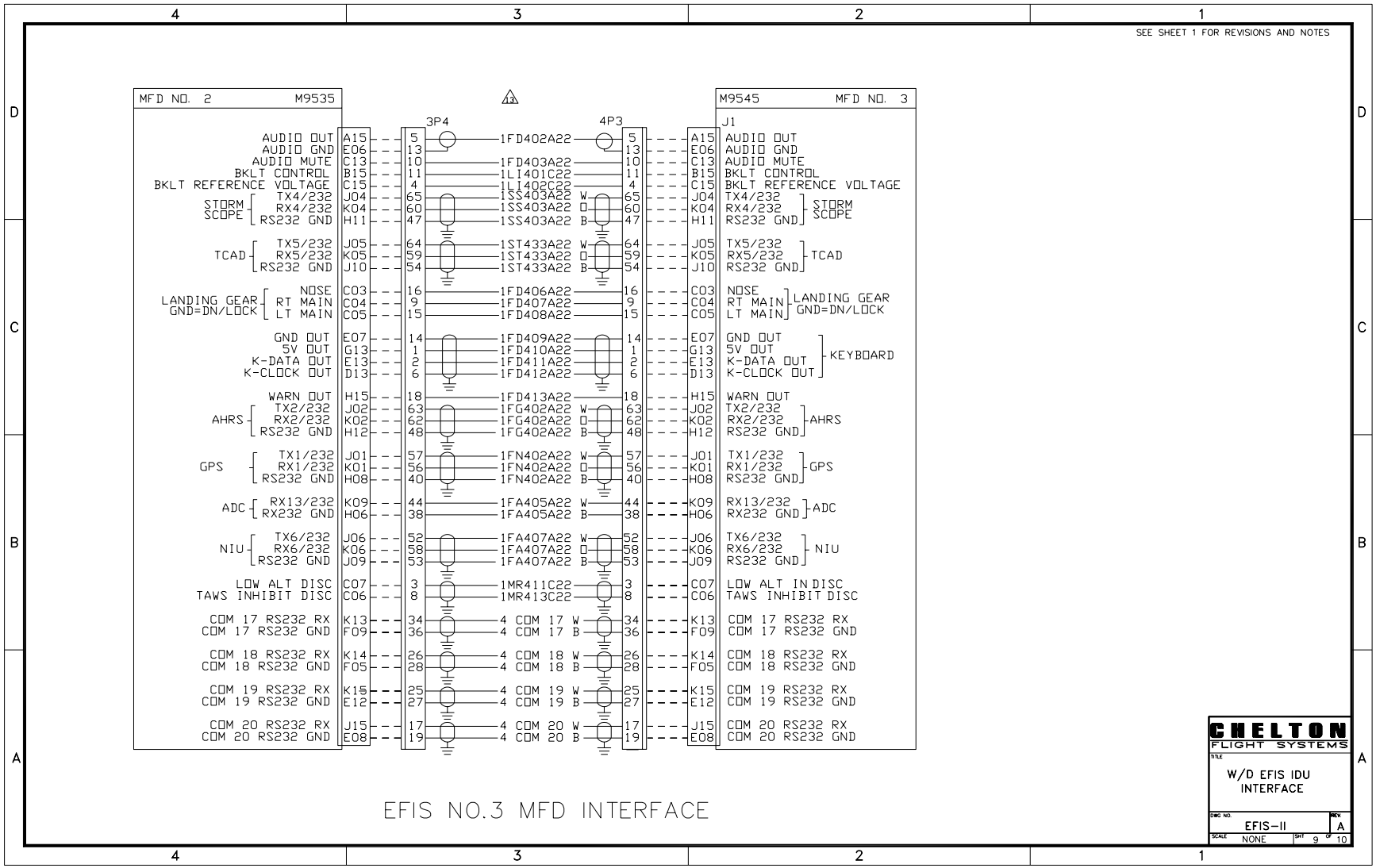

SEE SHEET 1 FOR REVISIONS AND NOTES
PFD NO.1 M9515
J1
ADC RS232 RX K09 GND H06
AHRS RS232 TX J02 RX K02 GND H12
GPS RS232 TX J01 RX K01 GND H08
STORMSCOPE RS232 TX J04 RX K04 GND H11
TCAD RS232 TX J05 RX K05 GND J10
NIU RS232 TX J06 RX J06 GND J09
P3
44 38
63 62 48
57 56 40
65 60 47
64 59 54
52 58 53
1FA105A22 W
1FA105A22 B
1FG102A22 O
1FG102A22 W
1FG102A22 B
1FN102A22 O
1FN102A22 W
1FN102A22 B
SS103A22 O
SS103A22 W
SS103A22 B
ST133A20 O
ST133A20 W
ST133A20 B
1FD107A22 O
1FD107A22 W
1FD107A22 B
ADC NO.1 M9511
P9511 21 4
J1
TX GND RS232 DATA
AHRS NO.1 M9513
P9513 2 1 9
J1
RX TX GND RS232 DATA
GPS NO.1 M9512
P9512 20 10 7
J1
RX TX GND RS232 DATA
STORMSCOPE
P3 6 20
J3
RX TX RS232 DATA
P2 5
J2
GND RS232 (OPTIONAL)
TCAD
P1 19 17 18
J1
RX RT GND RS232 DATA
(OPTIONAL)
NIU M9514
P9514 11 10 4
J1
RX TX GND RS232 DATA
(OPTIONAL
EFIS SINGLE NAV SOURCES INTERFACE
CHELTON FLIGHT SYSTEMS
TITLE
W/D EFIS IDU INTERFACE
DWG NO. EFIS-II
REV. A
SCALE NONE
SHT 4 OF 10


SEE SHEET 1 FOR REVISIONS AND NOTES
PFD NO. 1 M9515
M9525 MFD NO. 1
J1
1P4
2P3
AUDIO OUT A15 5 1FD202A22 5 A15 AUDIO OUT
AUDIO GND E06 13 13 E06 AUDIO GND
AUDIO MUTE C13 10 1FD203A22 10 C13 AUDIO MUTE
BKLT CONTROL B15 11 1LI201C22 11 B15 BKLT CONTROL
BKLT REFERENCE VOLTAGE C15 4 1LI202C22 4 C15 BKLT REFERENCE VOLTAGE
SIORM / SCOPE: TX4/232 J04 65 1SS203A22 W 65 J04 TX4/232
RX4/232 K04 60 1SS203A22 60 K04 RX4/232
RS232 GND H11 47 1SS203A22 B 47 H11 RS232 GND
TCAD: TX5/232 J05 64 1ST233A22 W 64 J05 TX5/232
RX5/232 K05 59 1ST233A22 59 K05 RX5/232
RS232 GND J10 54 1ST233A22 B 54 J10 RS232 GND
LANDING GEAR GND=DN/LOCK: NOSE C03 16 1FD206A22 16 C03 NOSE
RT MAIN C04 9 1FD207A22 9 C04 RT MAIN
LT MAIN C05 15 1FD208A22 15 C05 LT MAIN
KEYBOARD: GND OUT E07 14 1FD209A22 14 E07 GND OUT
5V OUT G13 1 1FD210A22 1 G13 5V OUT
K-DATA OUT E13 2 1FD211A22 2 E13 K-DATA OUT
K-CLOCK OUT D13 6 1FD212A22 6 D13 K-CLOCK OUT
WARN OUT H15 18 1FD213A22 18 H15 WARN OUT
AHRS: TX2/232 J02 63 1FG202A22 W 63 J02 TX2/232
RX2/232 K02 62 1FG202A22 62 K02 RX2/232
RS232 GND H12 48 1FG202A22 B 48 H12 RS232 GND
GPS: TX1/232 J01 57 1FN202A22 W 57 J01 TX1/232
RX1/232 K01 56 1FN202A22 56 K01 RX1/232
RS232 GND H08 40 1FN202A22 B 40 H08 RS232 GND
ADC: RX13/232 K09 44 1FA205A22 W 44 K09 RX13/232
RX232 GND H06 38 1FA205A22 B 38 H06 RX232 GND
NIU: TX6/232 J06 52 1FA207A22 W 52 J06 TX6/232
RX6/232 K06 58 1FA207A22 58 K06 RX6/232
RS232 GND J09 53 1FA207A22 B 53 J09 RS232 GND
LOW ALT DISC C07 3 1MR211C22 3 C07 LOW ALT IN DISC
TAWS INHIBIT DISC C06 8 1MR213C22 8 C06 TAWS INHIBIT DISC
COM 17 RS232 RX K13 34 2 COM 17 W 34 K13 COM 17 RS232 RX
COM 17 RS232 GND F09 36 2 COM 17 B 36 F09 COM 17 RS232 GND
COM 18 RS232 RX K14 26 2 COM 18 W 26 K14 COM 18 RS232 RX
COM 18 RS232 GND F05 28 2 COM 18 B 28 F05 COM 18 RS232 GND
COM 19 RS232 RX K15 25 2 COM 19 W 25 K15 COM 19 RS232 RX
COM 19 RS232 GND E12 27 2 COM 19 B 27 E12 COM 19 RS232 GND
COM 20 RS232 RX J15 17 2 COM 20 W 17 J15 COM 20 RS232 RX
COM 20 RS232 GND E08 19 2 COM 20 B 19 E08 COM 20 RS232 GND
EFIS NO. 1 MFD INTERFACE
CHELTON FLIGHT SYSTEMS
TITLE
W/D EFIS IDU INTERFACE
DWG NO. EFIS-II
REV. A
SCALE NONE
SHT 5 OF 10

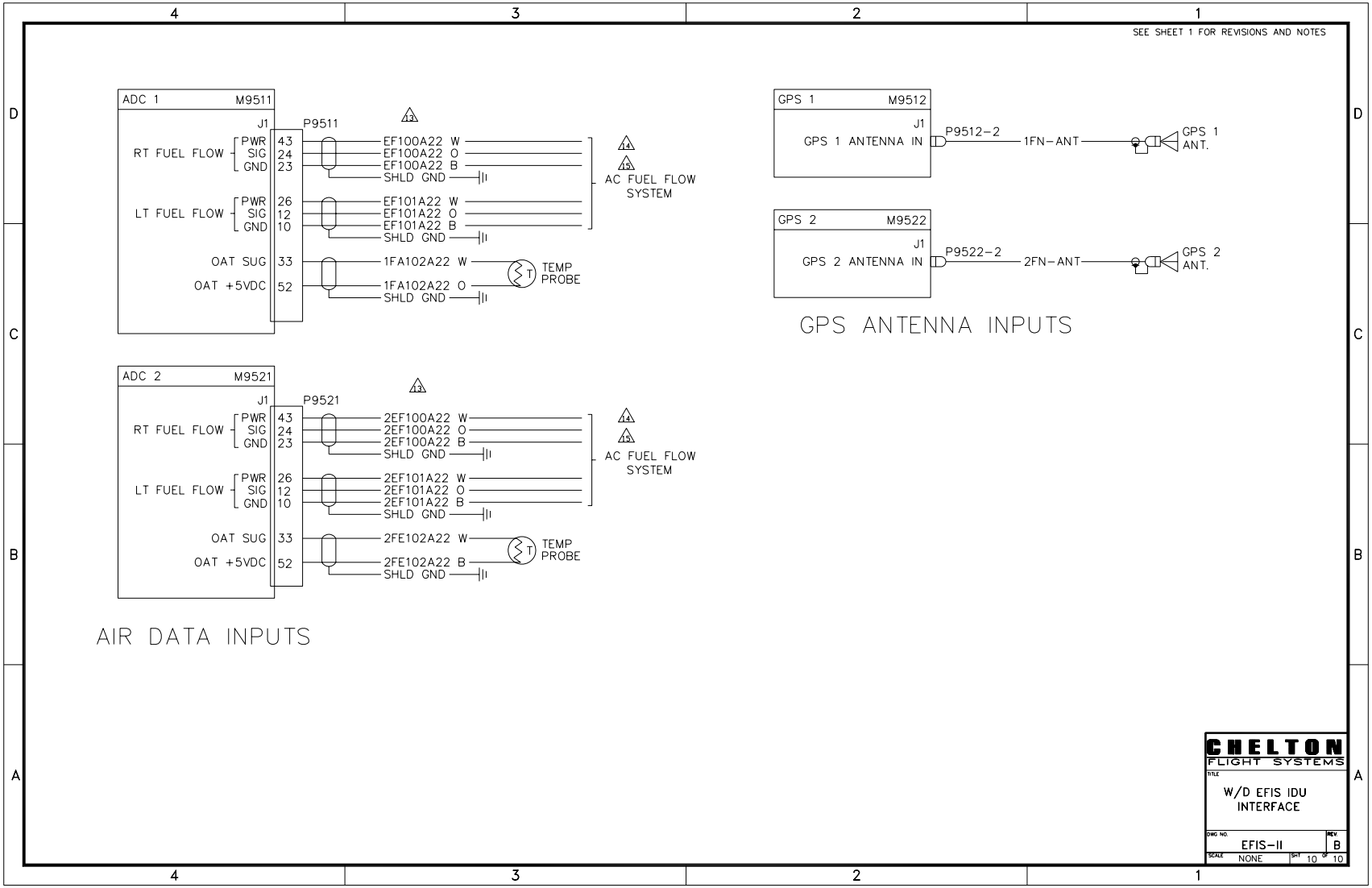

SEE SHEET 1 FOR REVISIONS AND NOTES
PFD NO.1 M9515
J1
ADC RS232 DATA IN
RX
GND
K09
H06
1P3
44
38
1FD116A22 W
1FD116A22 B
P9530
37
38
RMT SW M9530
J1
K1
P9530
20
21
1FA105A22 W
1FA105A22 B
P9511
21
4
ADC 1 M9511
TX
GND
RS232 DATA
3
4
2FA105A22 W
2FA105A22 B
P9521
ADC 2 M9521
AHRS RS232 DATA IN
TX
RX
GND
J02
K02
H12
63
62
48
1FD114A22 W
1FD114A22 O
1FD114A22 B
39
40
41
K2
22
23
24
1FG102A22 W
1FG102A22 O
1FG102A22 B
P9513
2
1
9
AHRS 1 M9513
RX
TX
GND
RS232 DATA
5
6
7
2FG102A22 W
2FG102A22 O
2FG102A22 B
P9523
AHRS 2 M9523
GPS RS232 DATA IN
TX
RX
GND
J01
K01
H08
57
56
40
1FN115A22 W
1FN115A22 O
1FN115A22 B
43
44
45
K3
26
27
28
1FN102A22 W
1FN102A22 O
1FN102A22 B
P9512
20
7
23
GPS 1 M9512
9
10
11
2FN102A22 W
2FN102A22 O
2FN102A22 B
P9522
GPS 2 M9522
CHELTON
FLIGHT SYSTEMS
W/D EFIS IDU INTERFACE
EFIS-II
A
NONE
6 OF 10
EFIS DUAL NAV SOURCES SWITCHING


SEE SHEET 1 FOR REVISIONS AND NOTES
REMOTE SWITCH NO.1 M9530
J1
M9530
29
12
18
1
25
8
GPS 1
GPS 2
1MR122A22N
S9507
1MR118A22
49
K3 CONTROL GND
ADC 1
ADC 2
1MR107A22N
S9506
1MR109A22
47
K1 CONTROL GND
AHRS 1
AHRS 2
1MR105A22N
S9505
1MR106A22
48
K2 CONTROL GND
17
28VDC/12VDC IN
EFIS DUAL NAV SOURCES SWITCHING
CHELTON
FLIGHT SYSTEMS
W/D EFIS IDU
INTERFACE
EFIS-II
B
NONE
7
10


SEE SHEET 1 FOR REVISIONS AND NOTES
MFD NO. 1 M9525
M9535 MFD NO. 2
J1
2P4
3P3
AUDIO OUT A15 5 1FD302A22 5 A15 AUDIO OUT
AUDIO GND E06 13 13 E06 AUDIO GND
AUDIO MUTE C13 10 1FD303A22 10 C13 AUDIO MUTE
BKLT CONTROL B15 11 1LI301C22 11 B15 BKLT CONTROL
BKLT REFERENCE VOLTAGE C15 4 1LI302C22 4 C15 BKLT REFERENCE VOLTAGE
STORM SCOPE TX4/232 J04 65 1SS303A22 W 65 J04 TX4/232
RX4/232 K04 60 1SS303A22 60 K04 RX4/232
RS232 GND H11 47 1SS303A22 B 47 H11 RS232 GND
STORM SCOPE
TCAD TX5/232 J05 64 1ST333A22 W 64 J05 TX5/232
RX5/232 K05 59 1ST333A22 59 K05 RX5/232
RS232 GND J10 54 1ST333A22 B 54 J10 RS232 GND
TCAD
LANDING GEAR GND=DN/LOCK NOSE C03 16 1FD306A22 16 C03 NOSE
RT MAIN C04 9 1FD307A22 9 C04 RT MAIN
LT MAIN C05 15 1FD308A22 15 C05 LT MAIN
LANDING GEAR GND=DN/LOCK
GND OUT E07 14 1FD309A22 14 E07 GND OUT
5V OUT G13 1 1FD310A22 1 G13 5V OUT
K-DATA OUT E13 2 1FD311A22 2 E13 K-DATA OUT
K-CLOCK OUT D13 6 1FD312A22 6 D13 K-CLOCK OUT
KEYBOARD
WARN OUT H15 18 1FD313A22 18 H15 WARN OUT
AHRS TX2/232 J02 63 1FG302A22 W 63 J02 TX2/232
RX2/232 K02 62 1FG302A22 62 K02 RX2/232
RS232 GND H12 48 1FG302A22 B 48 H12 RS232 GND
AHRS
GPS TX1/232 J01 57 1FN302A22 W 57 J01 TX1/232
RX1/232 K01 56 1FN302A22 56 K01 RX1/232
RS232 GND H08 40 1FN302A22 B 40 H08 RS232 GND
GPS
ADC RX13/232 K09 44 1FA305A22 W 44 K09 RX13/232
RX232 GND H06 38 1FA305A22 B 38 H06 RX232 GND
ADC
NIU TX6/232 J06 52 1FA307A22 W 52 J06 TX6/232
RX6/232 K06 58 1FA307A22 58 K06 RX6/232
RS232 GND J09 53 1FA307A22 B 53 J09 RS232 GND
NIU
LOW ALT DISC C07 3 1MR311C22 3 C07 LOW ALT IN DISC
TAWS INHIBIT DISC C06 8 1MR313C22 8 C06 TAWS INHIBIT DISC
COM 17 RS232 RX K13 34 3 COM 17 W 34 K13 COM 17 RS232 RX
COM 17 RS232 GND F09 36 3 COM 17 B 36 F09 COM 17 RS232 GND
COM 18 RS232 RX K14 26 3 COM 18 W 26 K14 COM 18 RS232 RX
COM 18 RS232 GND F05 28 3 COM 18 B 28 F05 COM 18 RS232 GND
COM 19 RS232 RX K15 25 3 COM 19 W 25 K15 COM 19 RS232 RX
COM 19 RS232 GND E12 27 3 COM 19 B 27 E12 COM 19 RS232 GND
COM 20 RS232 RX J15 17 3 COM 20 W 17 J15 COM 20 RS232 RX
COM 20 RS232 GND E08 19 3 COM 20 B 19 E08 COM 20 RS232 GND
EFIS NO. 2 MFD INTERFACE
CHELTON FLIGHT SYSTEMS
TITLE
W/D EFIS IDU INTERFACE
DWG NO. EFIS-II
REV. A
SCALE NONE
SHT 8 OF 10



EFIS NO.3 MFD INTERFACE


SEE SHEET 1 FOR REVISIONS AND NOTES
ADC 1 M9511
J1
P9511
RT FUEL FLOW
PWR 43
SIG 24
GND 23
EF100A22 W
EF100A22 O
EF100A22 B
SHLD GND
LT FUEL FLOW
PWR 26
SIG 12
GND 10
EF101A22 W
EF101A22 O
EF101A22 B
SHLD GND
AC FUEL FLOW SYSTEM
OAT SUG 33
OAT +5VDC 52
1FA102A22 W
1FA102A22 O
SHLD GND
TEMP PROBE
ADC 2 M9521
J1
P9521
2EF100A22 W
2EF100A22 O
2EF100A22 B
SHLD GND
2EF101A22 W
2EF101A22 O
2EF101A22 B
SHLD GND
2FE102A22 W
2FE102A22 B
SHLD GND
AIR DATA INPUTS
GPS 1 M9512
J1
GPS 1 ANTENNA IN
P9512-2
1FN-ANT
GPS 1 ANT.
GPS 2 M9522
J1
GPS 2 ANTENNA IN
P9522-2
2FN-ANT
GPS 2 ANT.
GPS ANTENNA INPUTS
CHELTON
FLIGHT SYSTEMS
TITLE
W/D EFIS IDU INTERFACE
DWG NO. EFIS-II
REV. B
SCALE NONE
SHT 10 OF 10

Chapter 4

EFIS Configuration

After the supporting components of the EFIS system have been installed and are functional, the system must be configured for the specific installation. The following section will explain in detail the individual steps and procedures required to tailor the EFIS to your installation.

CAUTION
Due to the critical flight information provided by the EFIS system, DO NOT fly the aircraft until ALL Sections of the EFIS configuration are complete and operationally verified.

GROUND MAINTENANCE FUNCTIONS (GMF)

EFIS configuration is performed with the Ground and Maintenance Functions (GMF). To initiate the GMF, insert the data card into the data card slot of an IDU prior to applying power.

CAUTION
Do not insert or remove the data card with power applied to the IDU as this will damage the data card.

After the card is completely inserted, apply power to the IDU. The IDU will sense the presence of the data card and the GMF will come up automatically as follows:

```
Chelton Flight Systems Ground and Maintenance Functions:

A = Run Demonstrator/Training Program
B = Update (Updates System Application and Data Files)
C = Download (Downloads LOG Files)
D = Fuel Tank Calibration (IDU #1 Only)
E = View Fuel Tank Calibration Map (IDU #1 Only)
F = View bitlog.dat
G = Goodrich WX-500 Maintenance Utility (IDU #1 Only)
H = Ryan TCAD Maintenance Utility (IDU #1 Only)
I = Terrain Data Verification
J = Format SmartMedia Card

Please make selection [A,B,C,D,E,F,G,H,I,J]?
```

Plug a PS/2 compatible keyboard into the keyboard connector. The keyboard will automatically control the IDU that is in GMF mode and will be ignored by all other IDUs. Select the desired menu option by typing the appropriate letter. Each menu option is further described below.

A (RUN DEMONSTRATOR/TRAINING PROGRAM)

Selecting option "A" will start the ground demonstration loop on the IDU. In the ground demonstration loop, the IDU flies a pre-recorded VOR-A approach to Reno, NV (KRNO). All IDU controls are functional during the ground demonstration loop. This allows the user to activate the menus and become familiar with the many features of the Chelton Flight Systems EFIS.

In addition to the IDU controls, the following keys can be toggled on the keyboard during the ground demonstration loop to simulate failure modes:

0 = All Systems OK
1 = GPS Failure
2 = Air Data/Engine Data Failure
3 = AHRS Failure
4 = GPS and Air Data/Engine Data Failure
5 = GPS and AHRS Failure
6 = Air Data/Engine Data Failure and AHRS Failure
7 = GPS, Air Data/Engine Data and AHRS Failure

While the operator may never actually see a failure mode in flight, it is prudent to become familiar with the system's capabilities in the event of sensor failure. Press "Q" to quit the ground demonstration loop.

B (UPDATE)

Selecting option "B" will start a system update. This function looks for the presence of update files on the data card. Update files are self-extracting zip files that unpack into certain locations of the IDU flashdrives. CRC-32s are integral to the updates to assure the integrity of the data. Possible update files are as follows:

navdata.exe: This file updates navigation data files.

obst.exe: This file updates obstruction data files.

update.exe: This file updates application and ground maintenance function files.

limits.txt: This file contains all of the engine and airframe data that is required for proper flight display on the EFIS. See the IDU Limits Programming section later in this chapter for further detail.

During the update, applicable directories are wiped clean prior to updating to prevent the retention of obsolete and extraneous files. In addition, during execution of each update file, file integrity messages for each extracted file will appear on the screen, and the update function will pause after each update file has finished executing. The user should review the file integrity messages for indications of errors. After each pause, press any key to continue the updating process. Should an error be detected, take the following steps:

1. Continue with the update process until you are returned to the GMF main menu.
2. Power down the IDU and remove the data card.
3. Reformat the data card using option "H."
4. Copy the applicable update files to the freshly formatted data card.
5. Re-attempt the update on the IDU.
6. If the update fails again, contact Chelton Flight Systems technical support.

After the update files execute, disk scanning and disk defragmentation utilities are run to verify flashdisk performance and to optimize the manner in which files are stored. The user is then returned to the GMF main menu.

As this function looks for the presence of update files and automatically runs the files without user prompting, it is important to ensure that the data card inserted in the IDU contains the latest update files. Accordingly, it is a good idea to erase or reformat the data card prior to copying update files to it. This will ensure that no old files exist on the data card and will minimize the chance of data errors during updating.

Note that terrain data is too large to be updated by a data card. Updating terrain data requires that the IDU be removed from its tray to gain access to the terrain data flashdisk slot in the top cover of the IDU. The terrain data flashdisk is manually replaced with an updated unit from Chelton Flight Systems. Update of the Terrain data base is performed by an authorized Chelton Flight Systems dealer as needed. Chelton Flight Systems will provide announcements to its authorized dealers when updates to the Terrain data base are available.

(1) An authorized Chelton Flight Systems dealer will remove each IDU from its rack.
(2) The flash card access cover located on top of the IDU will be removed to access the flash card.
(3) The mechanic will press the extraction button to eject the flash card from the IDU.
(4) The flash card will either be replaced with another flash card with an updated data base, or the mechanic will install the flash card in a suitable computer and copy the data from a CD-ROM supplied by Chelton Flight Systems.
(5) After updating the flash card, the card is removed from the computer and installed in the IDU.
(6) The cover access cover is replaced on the IDU and the IDU is installed in the rack.

C (DOWNLOAD)

Selecting option “C” will create a “\log” directory on the data card and copy the data logging files into the “\log” directory of the data card. The data logging files contain recordings of flight and engine parameters of up to 5 hours each from the previous 10 operations of the system. During system operation, flight and engine parameters are recorded every 1 second. Each time the parameters are recorded, a Zulu time stamp followed by 3 lines of comma delimited ASCII text data are written where the first line contains flight parameters, the second line contains engine #1 parameters and the third line contains engine #2 parameters.

NOTE:
Engine parameters will contain no information in certified installations at this time.

The following table shows the exact data format:

First Line (Flight)	Second Line (Engine #1)	Third Line (Engine #2)
Latitude (°)	RPM[1]	RPM[1]
Longitude (°)	Fuel Flow (GPH)	Fuel Flow (GPH)
MSL Altitude (ft)	Aux. 1[2]	Aux. 1[2]
Pitch Angle (°)	Left Fuel (Gal.)	--
Bank Angle (°)	Right Fuel (Gal.)	--
Heading (° Mag.)	Fuel Pressure (PSI)	Fuel Pressure (PSI)
Track (° Mag.)	Aux. 5[3]	Aux. 5[3]
IAS (kts)	Oil Temperature (°F)	Oil Temperature (°F)
TAS (kts)	Oil Pressure (PSI)	Oil Pressure (PSI)
Ground Speed (kts)	Volts	Volts
VSI (fpm)	EGT #1 (°F)[4]	EGT #1 (°F)[4]
Glidepath (°)	CHT #1 (°F)[5]	CHT #1 (°F)[5]
G-force	EGT #2 (°F)[6]	EGT #2 (°F)[6]
Wind Speed (kts)	CHT #2 (°F)	CHT #2 (°F)
Wind Direction (° Mag.)	EGT #3 (°F)	EGT #3 (°F)
OAT (°F)	CHT #3 (°F)	CHT #3 (°F)
Density Altitude (ft)	EGT #4 (°F)	EGT #4 (°F)
Fuel Totalizer Qty. (Gal.)	CHT #4 (°F)	CHT #4 (°F)
--	EGT #5 (°F)	EGT #5 (°F)
--	CHT #5 (°F)	CHT #5 (°F)
--	EGT #6 (°F)	EGT #6 (°F)
--	CHT #6 (°F)	CHT #6 (°F)
--	Aux. Temp. 1 (°F)[7]	Aux. Temp. #1 (°F)[7]
--	Aux. Temp. 2 (°F)[8]	Aux. Temp. #2 (°F)[8]
--	Induction Temperature (°F)	Induction Temperature (°F)

[1]N1 (%) on turbine engine installations.
[2]Manifold pressure (in.Hg) on piston engine installations.
[3]Water temperature (°F) on liquid cooled engine installations. Fuel Pressure #2 on turbine engine installations.
[4]TIT1 or ITT (°F) on turbine engine installations.
[5]N2 on turbine engine installations.
[6]TIT2 (°F) on turbine engine installations.
[7]TIT1 (°F) on piston engine installations.
[8]TIT2 (°F) on piston engine installations. Torque (%) on turbine engine installations.

D (Fuel Tank Calibration):

Selecting option "D" will begin the fuel tank calibration program for non-certified installations. The EFIS uses a tank calibration "map" to accurately convert non-dimensional fuel level signals from the fuel level sensors into fuel volume readings. This allows the full accuracy of the sensors to be realized and also corrects for fuel tank shape irregularities. Fuel tank calibration is the process by which the "map" is constructed. The fuel tank calibration program can only be run from IDU #1. Upon normal system startup, the "map" stored in IDU #1 will be transmitted to other IDUs for synchronization.

Prior to performing the fuel tank calibration, the following items must be completed:

In installations that use Vision Microsystems or Electronics International capacitance fuel level probes, a Capacitance Converter Box for each sensor must be installed and calibrated.

EAU fuel sensor calibrations are set as follows:

2SF = 500
2OFF = 0
3SF = 500
3OFF = 0

Verify by prior fueling the exact volume of useable fuel held by the left and right wing tanks. During this verification, ensure the following:

Cross feeding between fuel tanks is affirmatively prevented.
Aircraft is in a level-flight attitude.
Unusable fuel or fuel that has drained into sumps or fuel lines is subtracted from the tank total.

Use the "IDU Limits" program to select the fuel level probe interface ("Fuel Sensor Flag = 1") and set the per tank fuel capacity. If the useable fuel quantity differs between the left and right tanks, use the lesser value as the fuel capacity setting.

Start the fuel calibration with all useable fuel drained from the tanks, the aircraft in a level-flight attitude, and cross feeding between fuel tanks affirmatively prevented.

After selecting option “D” the following screen appears:

```
================================================================================
This utility calibrates the fuel senders in the left and right fuel tanks
of your aircraft.  This procedure accounts for irregularities in the shape
of your aircraft's fuel tanks and enables the EFIS to display accurate fuel
quantity.

This procedure requires that you begin with a defueled aircraft and add
fuel to each tank in 10 equal increments.  The engine page setup for your
aircraft currently shows that each tank holds [*] gallons.  These tanks
will be calibrated by adding 10 equal increments of [*] gallons.  If the
capacity of each tank is not [*] gallons then exit this program and reset
the fuel tank limits before proceeding.
================================================================================

Press any key to continue or 'Q' to quit:
```

*The value displayed will vary with configuration. It is derived from the value entered during the IDU Limit setup.

Once into the fuel calibration routine, follow the on-screen prompts to create calibration maps for the fuel tanks. It is recommended that each of the map values be recorded on a Software System Configuration Sheet (SSCS) and attached to the airframe logbook for future reference. When the calibration is finished, the system will automatically reboot.

E (View Fuel Tank Calibration Map):

Selecting option "E" allows the user to view and edit the fuel tank calibration map for non-certified installations. This allows errors in the map to be corrected without the need for going through a complete fuel tank calibration. The view fuel tank calibration map program can only be run from IDU #1. Upon normal system startup, the "map" stored in IDU #1 will be transmitted to other IDUs for synchronization.

After selecting option "E" the following screen appears:

```
====================== FUEL CALIBRATION MAP ======================
|          Left Tank           |          Right Tank           |
| Point Gallons Sensor Output  | Point Gallons Sensor Output   |
|                              |                               |
|   1     0.0*       0.0*      |   12    0.0*        0.0*      |
|   2     6.0*      53.0*      |   13    6.0*       40.0*      |
|   3    12.0*      74.0*      |   14   12.0*       76.0*      |
|   4    18.0*     127.0*      |   15   18.0*      124.0*      |
|   5    24.0*     164.0*      |   16   24.0*      163.0*      |
|   6    30.0*     198.0*      |   17   30.0*      205.0*      |
|   7    36.0*     247.0*      |   18   36.0*      244.0*      |
|   8    42.0*     280.0*      |   19   42.0*      285.0*      |
|   9    48.0*     325.0*      |   20   48.0*      321.0*      |
|  10    54.0*     362.0*      |   21   54.0*      358.0*      |
|  11    60.0*     397.0*      |   22   60.0*      397.0*      |
==================================================================

Edit which point? (Press 'Q' to quit)
```

*The values displayed will vary with the actual calibration map

To edit a point, type the point number and enter the new Sensor Output value. It is recommended that each of the map values be recorded on sheet and attached to the airframe logbook for future reference. Type "Q" when finished. The IDU will return to the Ground and Maintenance Functions menu.

F (View bitlog.dat):

Selecting option “F” allows the user to view the “bitlog.dat” file generated on each system startup. During startup, the system performs a CRC-32 calculation on each vital file and compares the result to stored CRC-32 values. Any disagreement between CRC-32 values means that a file has been corrupted and the system is unreliable. The system will not start when this condition exists.

Should the system fail to start due to a bad CRC-32 check, this option can be used to view the “bitlog.dat” file so that the corrupted file can be identified. Contact Chelton Flight Systems technical support with the identity of the corrupt file so that an update file to cure the corruption can be sent.

After selecting option “F” the following screen appears:

```
Start Up Time:  06-15-2002  13:17:16
  efis.exe     OK          dos4gw.exe   OK
  aclimits.dat OK          englimit.dat OK
  fuelimit.dat OK          airport.dat  OK
  airspace.dat OK          airways.dat  OK
  apph.dat     OK          appw.dat     OK
  comm.dat     OK          fix.dat      OK
  ndb.dat      OK          runway.dat   OK
  sidh.dat     OK          sidw.dat     OK
  sidrwh.dat   OK          sidrww.dat   OK
  starh.dat    OK          starw.dat    OK
  starrwh.dat  OK          starrww.dat  OK
  stats.dat    OK          termfix.dat  OK
  termndb.dat  OK          vor.dat      OK
  obst.dat     OK          obstdate.dat OK
  terr flag    OK
Press any key to continue . . .
```

Any corrupted file will be identified by the word “FAIL” next to the file name. Press any key to return to the Ground and Maintenance Functions menu.

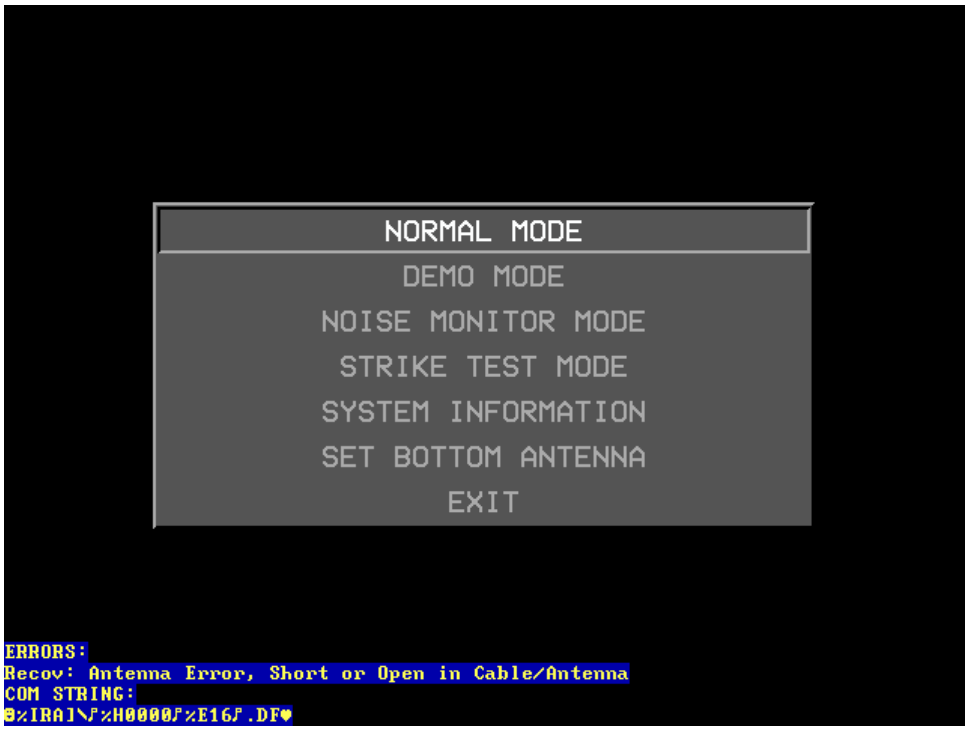
G (Goodrich WX-500 Maintenance Utility):

Selecting option "G" starts the maintenance utility for the Goodrich WX-500 passive lightning sensor. Before running the WX-500 maintenance utility, ensure the following:

1. The WX-500 equipment is installed as recommended by the manufacturer.
2. The WX-500 is properly connected to the IDU as specified in the WX-500 Installation Instructions.
3. A Software Configuration Card with the WX-500 option enabled is installed in the IDU tray. If this is not done, the warning message "Make sure that you are using IDU#1 and that the aircraft limits configuration specifies that a WX-500 is installed" will appear and the WX-500 maintenance utility will not start.
4. Only run the WX-500 maintenance utility from IDU #1. If this is not done, the warning message "Make sure that you are using IDU#1 and that the aircraft limits configuration specifies that the WX-500 is installed" will appear and the WX-500 maintenance utility will not start.

The following describes the various pages of the WX-500 maintenance utility:

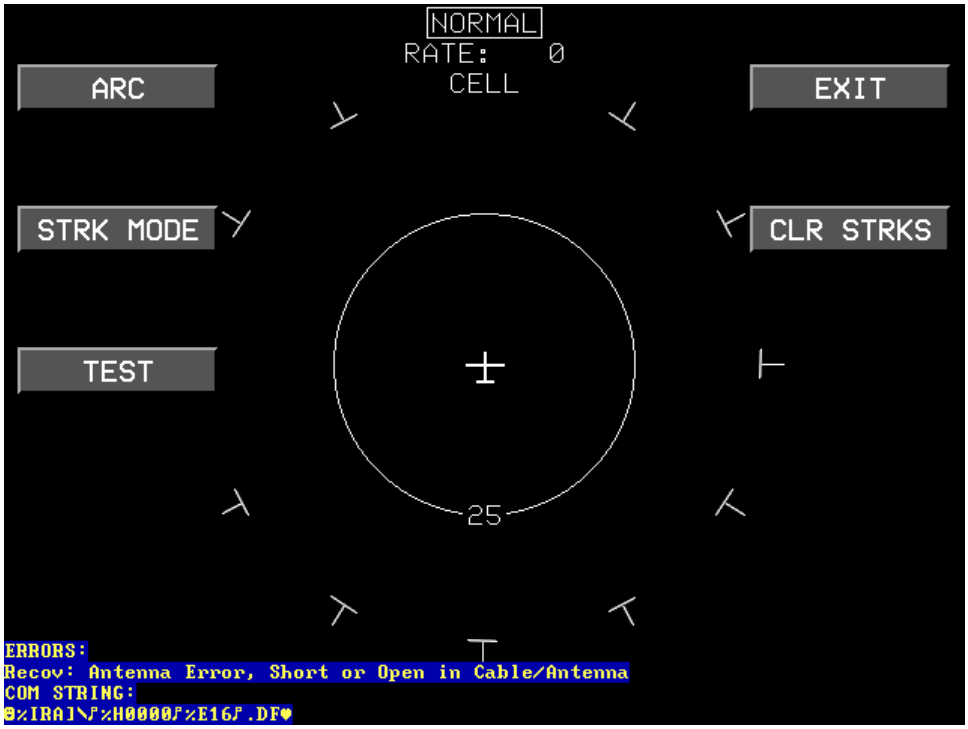
Main Page:



This page allows the user to select the various options needed for installation and maintenance of the WX-500. The last communication string received from the WX-500 and a listing of active errors appears in the lower left corner of the page. An option box appears in the center of the page for selecting the other pages (Normal Mode, Demo Mode, Noise Monitor Mode, Strike Test Mode, System Information), for setting the WX-500 software antenna setting, and for exiting the WX-500 maintenance utility.

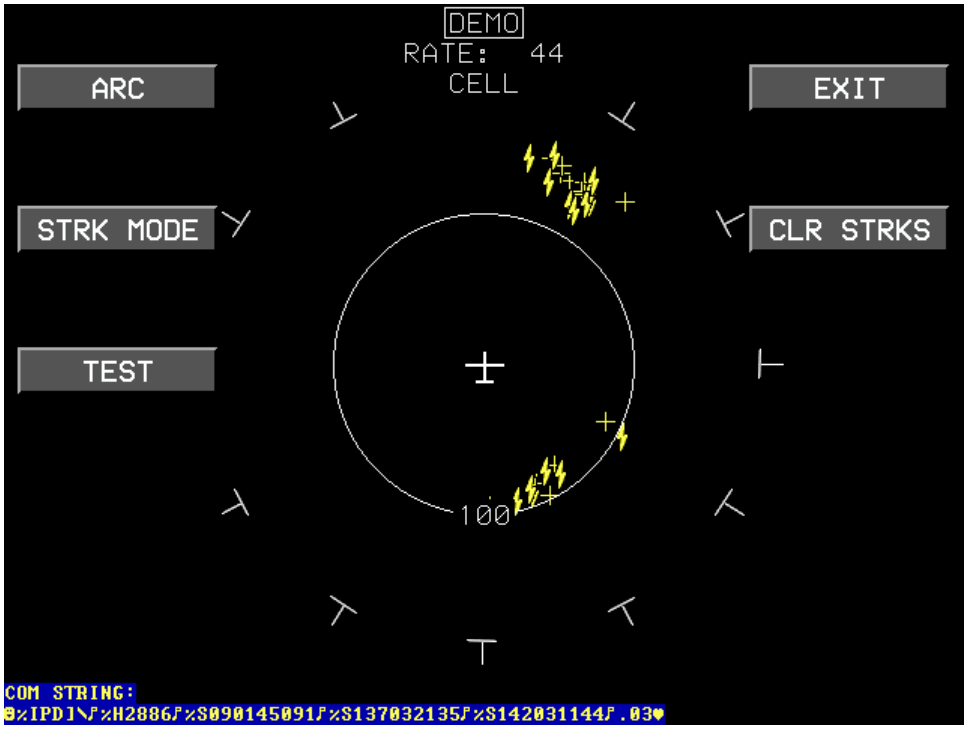
The software antenna setting option is used to clear an "Antenna jumper changed from last operation" error message. The WX-500 maintenance utility receives antenna jumper position from the WX-500 and automatically selects the proper software antenna setting (top or bottom) for transmission to the WX-500. However, transmission of the software antenna setting to the WX-500 does not occur until the "SET [TOP/BOTTOM] ANTENNA" option tile is selected with the lower right rotary encoder. Thus, the jumper error message will not be cleared until the software antenna setting option is physically activated by the user. This allows the user a chance to verify that the antenna jumpers are properly positioned prior to clearing the jumper error.

Normal Mode:



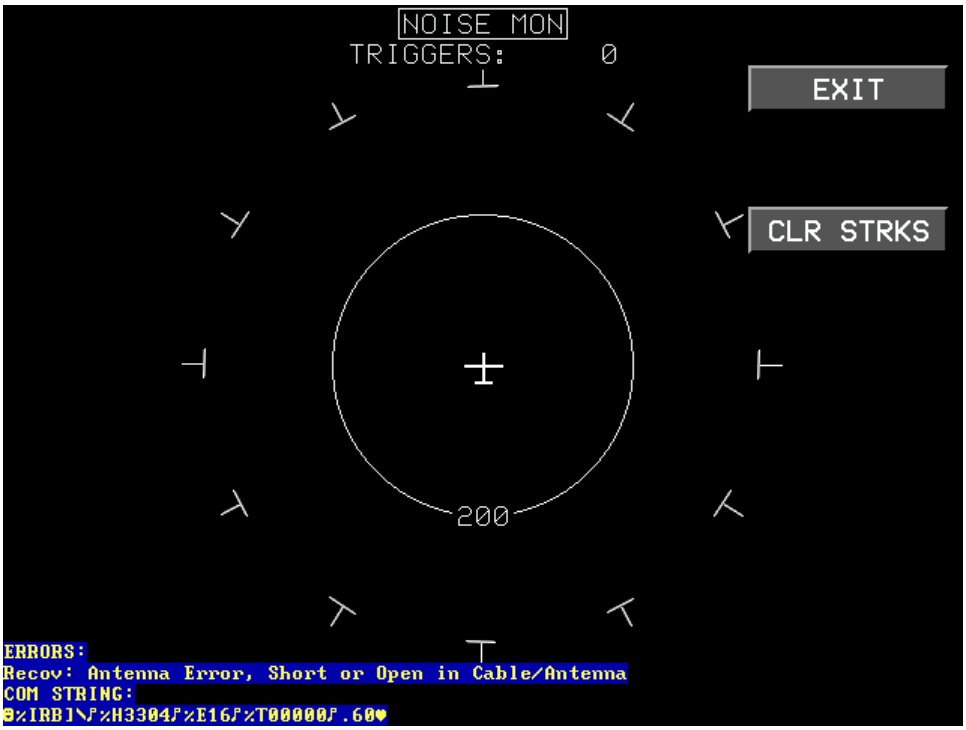
The normal mode puts the WX-500 into normal operation. The last communication string received from the WX-500 and a listing of active errors appears in the lower left corner of the page. Soft menu selections allow the user to select arced or centered (360° view) displays, select strike mode or cell mode, perform pilot-initiated tests, clear strikes, or exit to the main page. Display scale is changed by rotating the lower right rotary encoder. Detected strikes will appear within the display using the symbology described in the User's Manual. See WX-500 documentation for further explanation of WX-500 modes and options.

Demo Mode:



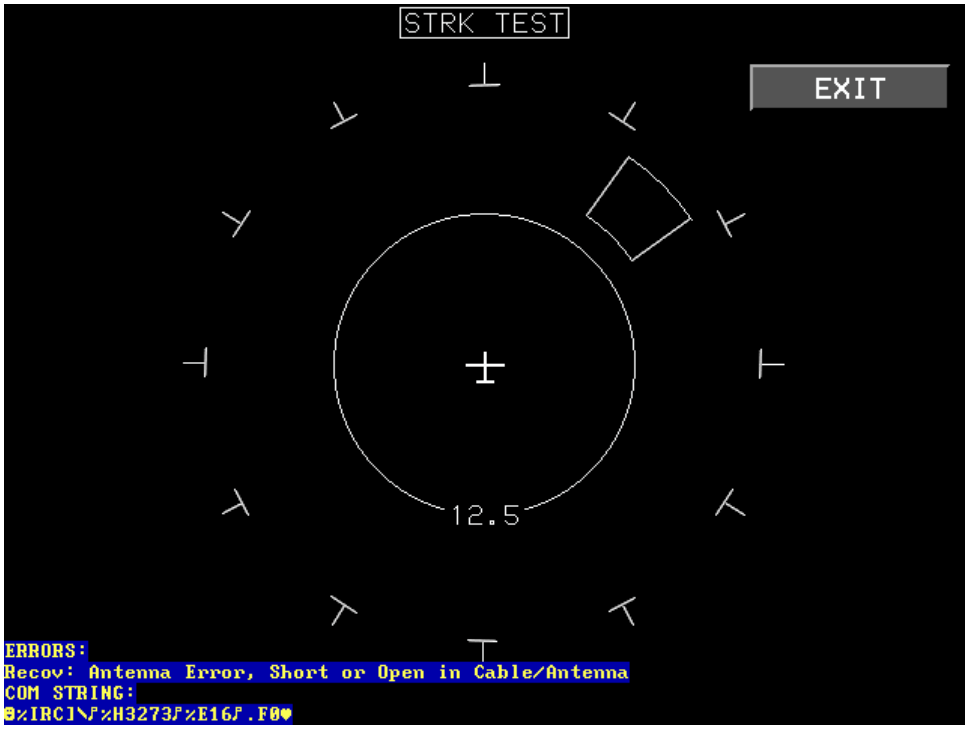
The demo mode puts the WX-500 into a demonstration mode of operation. The last communication string received from the WX-500 and a listing of active errors appears in the lower left corner of the page. Soft menu selections allow the user to select arced or centered (360° view) displays, select strike mode or cell mode, perform pilot-initiated tests, clear strikes, or exit to the main page. Display scale is changed by rotating the lower right rotary encoder. Simulated strikes will appear within the display using the symbology described in the User's Manual. See WX-500 documentation for further explanation of WX-500 modes and options.

Noise Monitor Mode:



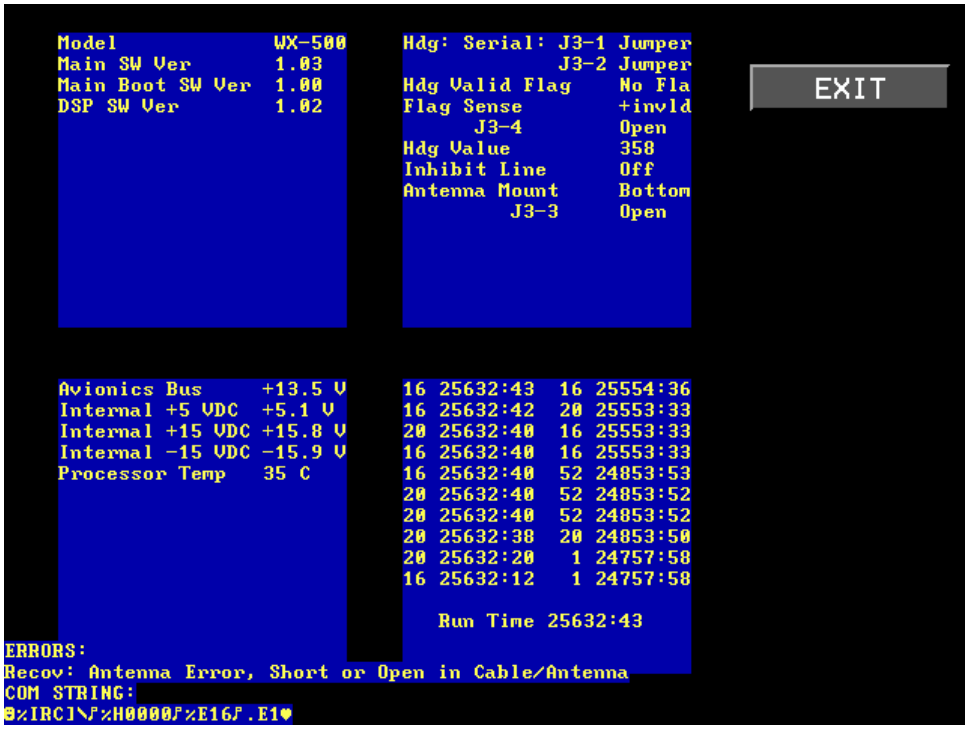
The noise monitor mode puts the WX-500 into noise monitor mode of operation. This mode shows a special high-sensitivity 400NM scale and is used to select a noise-free antenna mounting location. The last communication string received from the WX-500 and a listing of active errors appears in the lower left corner of the page. Soft menu selections allow the user to clear strikes, or exit to the main page. Display scale cannot be changed in this mode. Detected noise will increment the trigger count and appear as strikes using the symbology described in the User's Manual. See WX-500 documentation for further explanation of the noise monitor mode.

Strike Test Mode:



The strike test mode puts the WX-500 into strike test mode of operation. This mode shows a special target box at the 1 to 2 o'clock position and is used to verify that test strikes are being properly processed and displayed. The last communication string received from the WX-500 and a listing of active errors appears in the lower left corner of the page. A soft menu selection allows the user to exit to the main page. Display scale is fixed at 25NM and cannot be changed in this mode. Test strikes using the symbology described in the User's Manual should appear within the confines of the target box. Test strikes disappear after one second and do not age in the normal manner. This allows the user to confirm continuous sensing of test strikes that are generated approximately every two seconds by the Goodrich testing equipment. See WX-500 documentation for further explanation of the strike test mode.

System Information Page:



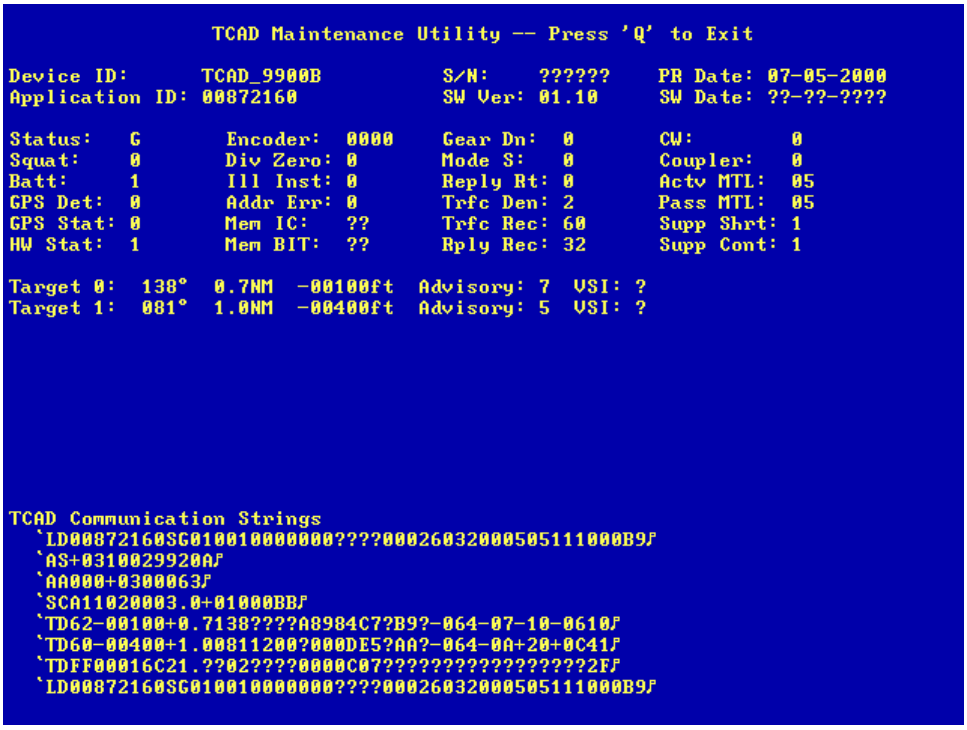
The system information page displays the four pages of system information transmitted by the WX-500. These pages are used for general troubleshooting of the WX-500. The last communication string received from the WX-500 and a listing of active errors appears in the lower left corner of the page. A soft menu selection allows the user to exit to the main page. See WX-500 documentation for further explanation of the system information page.

H (Ryan TCAD Maintenance Utility):

Selecting option "H" starts the maintenance utility for the Ryan TCAD 9900B passive traffic advisory system and TCAD 9900BX active traffic advisory system. Before running the TCAD maintenance utility, ensure the following:

1. The TCAD equipment is installed as recommended by the manufacturer.
2. The TCAD is properly connected to the IDU as specified in the TCAD Installation Instructions.
3. A Software Configuration Card with the TCAD option enabled is installed in the IDU tray. If this is not done, the warning message "Make sure that you are using IDU#1 and that the aircraft limits configuration specifies that a TCAD is installed" will appear and the TCAD maintenance utility will not start.
4. Only run the TCAD maintenance utility from IDU #1. If this is not done, the warning message "Make sure that you are using IDU#1 and that the aircraft limits configuration specifies that a TCAD is installed" will appear and the TCAD maintenance utility will not start.

The TCAD maintenance utility consists of a single page with three different areas as shown below:



The top third of the TCAD maintenance utility page displays system parameters transmitted by the TCAD. Refer to documentation from Ryan International for details.

The middle third of the TCAD maintenance utility page displays current targets being transmitted by the TCAD. Target parameters include bearing (in degrees relative to nose position), range in nautical miles, relative altitude in feet (negative = traffic below, positive = traffic above), advisory level (0 to 7 with higher numbers being more critical), and VSI (+ = climbing more than 500fpm, - = descending more than 500fpm, ? = VSI is less than 500fpm).

The bottom third of the TCAD maintenance utility page displays in real time the communication strings sent by the TCAD.

Press “Q” to exit the TCAD maintenance utility. After exiting, the IDU will reboot.

I (Terrain Data Verification):

Selecting option "I" will verify the terrain database on the IDU. The Terrain Data Verification option performs a CRC-32 test of all of the terrain data packets stored on the hard drive. This test is only performed on condition, when the terrain database has been updated, or if an error occurs during flight.

If a data packet passes test, then an "OK" will be displayed after the file shown on the screen. If a packet fails, then a "FAIL" will be displayed.

```
C:\data\terrain\N19W100.dat  OK
C:\data\terrain\N19W101.dat  OK
C:\data\terrain\N19W102.dat  OK
C:\data\terrain\N19W103.dat  OK
C:\data\terrain\N19W104.dat  OK
C:\data\terrain\N19W105.dat  OK
C:\data\terrain\N19W106.dat  OK
C:\data\terrain\N19W107.dat  OK
BIT check finished – All terrain files OK!
Press any key to continue . . .
```

If a failure does occur, the mechanic should re-load terrain data from a known good source, or contact Chelton Flight Systems technical support for a new terrain database card.

Pressing a key at the prompt will place the IDU back to the Ground and Maintenance Functions menu.

J (Format Data Card):

Selecting option "J" will format the data card. You'll be prompted as follows:

```
WARNING!
ALL DATA ON REMOVABLE DISK
DRIVE E: WILL BE LOST!
Proceed with Format (Y/N)?
```

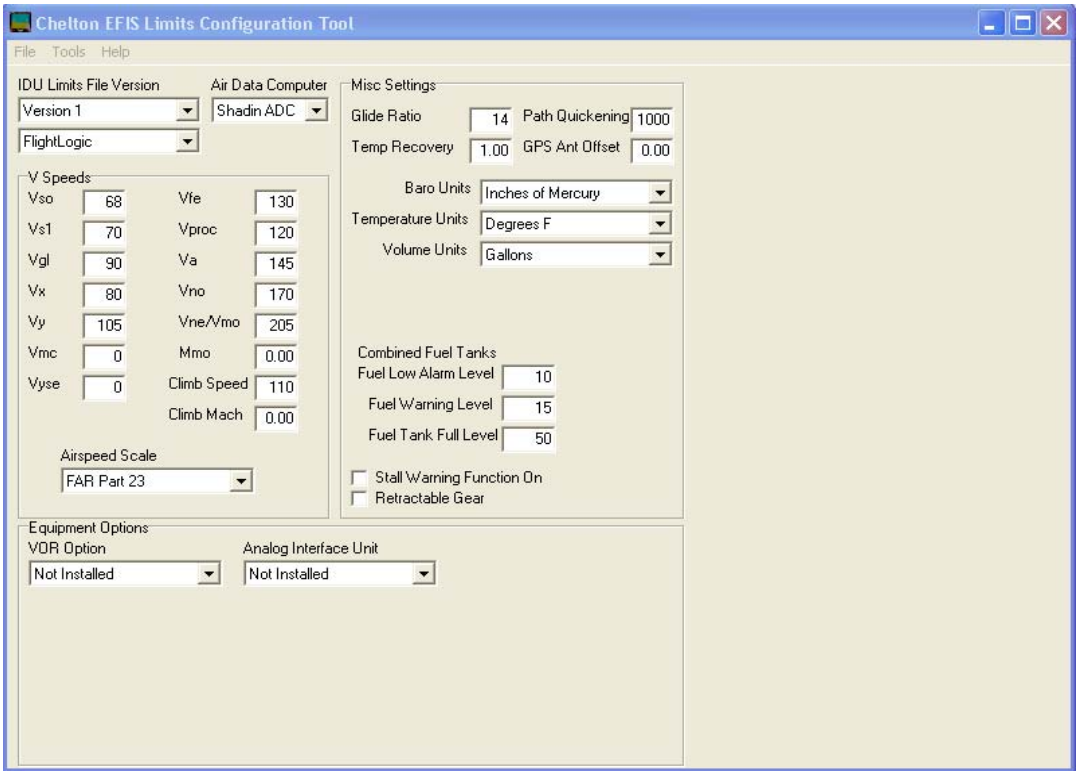
To continue, press "Y" and ENTER. Formatting will proceed and you will be prompted to input a volume label. To continue, press ENTER. The data card is now formatted.

IDU LIMITS PROGRAMMING

The IDU Limits software is installed on a computer running Windows® 95 or greater and has access to a SmartMedia card reader/writer. The software allows user modification of aircraft operational parameters on the EFIS for each aircraft.

WARNING!
Failure to program the EFIS for aircraft specific limits prior to first flight will cause unsafe flight conditions that may result in a catastrophic or fatal accident.

The modified limits are saved to a file on the computer named "*limits.txt*". This file is copied to a SmartMedia card in the root directory (*x*:\), then installed in the PFD for updating the EFIS. Update of the limits is performed by selecting item "B" from the Ground Maintenance menu described above.



The IDU Limits software is installed by running the setup program bundled with the software package. Default installation will place the "IDU Limits.exe" program in the directory C:\Program Files\Chelton Flight Systems\IDU Limits and will set the associated menu to "IDU Limits".

The menu bar consists of two tabs. These are:

Files

OPEN – Opens and existing "limits.txt" file on the computer or associated drives.

SAVE – Saves to the file "limits.txt".

EXIT – Exits the IDU Limits program.

Tools

TEMPERATURE RECOVERY FACTOR CALCULATOR TOOL – Calculates the outside air temperature recovery factor from altitude, air speed, and OAT data collected during test flights.

Help

INSTRUCTIONS – Opens a dialog box with a description of the limits to be modified.

ENGINE PARAMETERS – Opens a dialog box with a brief description of engine settings (experimental installation only).

ABOUT – Displays the first screen when launching the program.

The programmable limits are displayed as pull-down pick list items or user entry boxes. These limits are grouped into five sections which include: software version, V speeds, equipment options, miscellaneous settings, and engine page.

NOTE:
Engine page is only available in the experimental EFIS. Accessing or altering the settings in the engine page section will not effect the EFIS in the certified version.

IDU Limits File Version

The IDU limits file version is determined by the software revision on the IDU. For software revisions of 4.0F and earlier, the limits file version is 1. For software revisions of 4.0G and higher, the limits file version is 2.

WARNING!
Ensure the limits file version corresponds to the software revision on the IDU. Selecting the wrong limits file version will cause the EFIS to error on initialization.

IDU Software Version
The IDU software version for the certified EFIS system is "FLIGHTLOGIC" only. All other selectable versions are not authorized for the certified EFIS system.

WARNING!
Selecting a software version other than "FLIGHTLOGIC*" will cause an error in the system and will not allow the EFIS to operate.

Air Data Computer
This option selects the type of air data computer that is interfaced with the EFIS. The options are:

ARINC 429 – Uses an existing ADC with ARINC-429 capability
Chelton EAU – Uses the CFS Engine and Air data Unit (experimental only)
Chelton ADC – Uses the CFS Air Data Unit
Shadin ADC – Uses the Shadin ADC-2000 for Chelton interface

V Speeds
The V Speeds are defined below:

Vso - The aircraft's stalling speed (in knots) at gross weight with gear and flaps extended. This value defines the bottom of the "white arc" area of the IDU airspeed indicator scale and the top of the "red arc" low-speed awareness area of the IDU airspeed indicator scale. This value is mandatory.

Vs1 - The aircraft's stalling speed (in knots) at gross weight with gear and flaps retracted. If Vno is non-zero, then Vs defines the bottom of the "green arc" area of the IDU airspeed indicator scale. This value also defines the location of the "Vs" airspeed scale marker in 1-G flight, is used for calculating the pitch limit indicator symbology and for

determining whether the aircraft is in ground or flight mode. This value is mandatory.

Vgl - The aircraft's best glide speed (in knots) at gross weight with gear and flaps retracted. This value defines the location of the "green dot" best glide speed marker on the airspeed scale and is used for calculating the glide range display. This value is mandatory.

Vx - The aircraft's best angle of climb speed (in knots) at gross weight with gear and flaps retracted. This value defines the location of the "Vx" airspeed scale marker. If this value is set to 0, the "Vx" airspeed scale marker is not shown.

Vy - The aircraft's best rate of climb speed (in knots) at gross weight with gear and flaps retracted. This value defines the location of the "Vy" airspeed scale marker. If this value is set to 0, the "Vy" airspeed scale marker is not shown.

Vmc - The aircraft's minimum control speed (in knots) with the critical engine inoperative. This value defines the location of the "Vmc" redline. If this value is set to 0, the "Vmc" redline is not shown.

Vyse - The aircraft's single engine best rate of climb speed (in knots) at gross weight with gear and flaps retracted. This value defines the location of the "Vyse" blue line. If this value is set to 0, the "Vyse" blue line is not shown.

Vfe - The aircraft's maximum flap extended speed (in knots). This value defines the top of the "white arc" area of the IDU airspeed indicator scale. This value is mandatory.

Vproc - The aircraft's normal speed (in knots) for flying instrument approaches (DPs, IAPs, and STARs). This value is used for calculating the turn radius used for instrument procedure legs. This value is mandatory.

Va - The aircraft's maneuvering speed (in knots) at gross weight. This value defines the location of the "Va" airspeed scale marker. If this value is set to 0, the "Va" airspeed scale marker is not shown.

Vno - The aircraft's maximum structural cruising speed (in knots) defined as the maximum speed for operation in turbulence.

This value defines the top of the "green arc" and the bottom of the "yellow arc" areas of the IDU airspeed indicator scale. If this value is set to 0, then the "green arc" and "yellow arc" areas are not shown.

Vne/mo - The aircraft's never exceed speed (in knots). Vmo is the aircraft's maximum operating limit speed (in knots). Either this value or the airspeed equivalent of Mmo, whichever is lower, defines the bottom of the high-speed "red arc" area of the IDU airspeed indicator scale. In addition, if a Vno value exists, then this value is assumed to be Vne and defines the top of the "yellow arc" area of the IDU airspeed indicator scale. This value is mandatory.

Mmo - The aircraft's maximum operating Mach number. This value is converted to airspeed by the IDU depending upon the value of outside air temperature and pressure. Either this value or Vmo, whichever is lower, defines the bottom of the high-speed "red arc" area of the IDU airspeed indicator scale. Vmo typically controls at low altitude while Mmo typically controls at high altitude. If this value is set to 0, then Vne/Vmo value is assumed to be Vne and Mmo is not used.

Climb Speed - The aircraft's preferred cruise-climb speed (in knots). Either this value or the airspeed equivalent of climb Mach, whichever is lower, defines the speed for determining the maximum autopilot pitch steering target. This value is mandatory.

Climb Mach - The aircraft's preferred climb Mach number. If climb Mach is non-zero, then climb Mach is converted to airspeed by the IDU depending upon the value of outside air temperature and pressure. Autopilot pitch steering during climb uses the lower of climb speed or converted climb Mach as the speed for determining the maximum pitch steering target. Climb speed typically controls at low altitude while climb Mach typically controls at high altitude. If this value is set to 0, then climb Mach is not used.

The Airspeed Scale dropdown control allows the airspeed scale markings to be set to the appropriate certification category. This provides the ability to adapt the airspeed indicator to the specific certification part that the aircraft is certified under.

Equipment Options

The equipment options are defined as follows:

VOR Option - Used to select the source (if any) of VOR omnibearing data. Choices are None, RS-232 from the Analog Interface Unit, and ARINC 429.

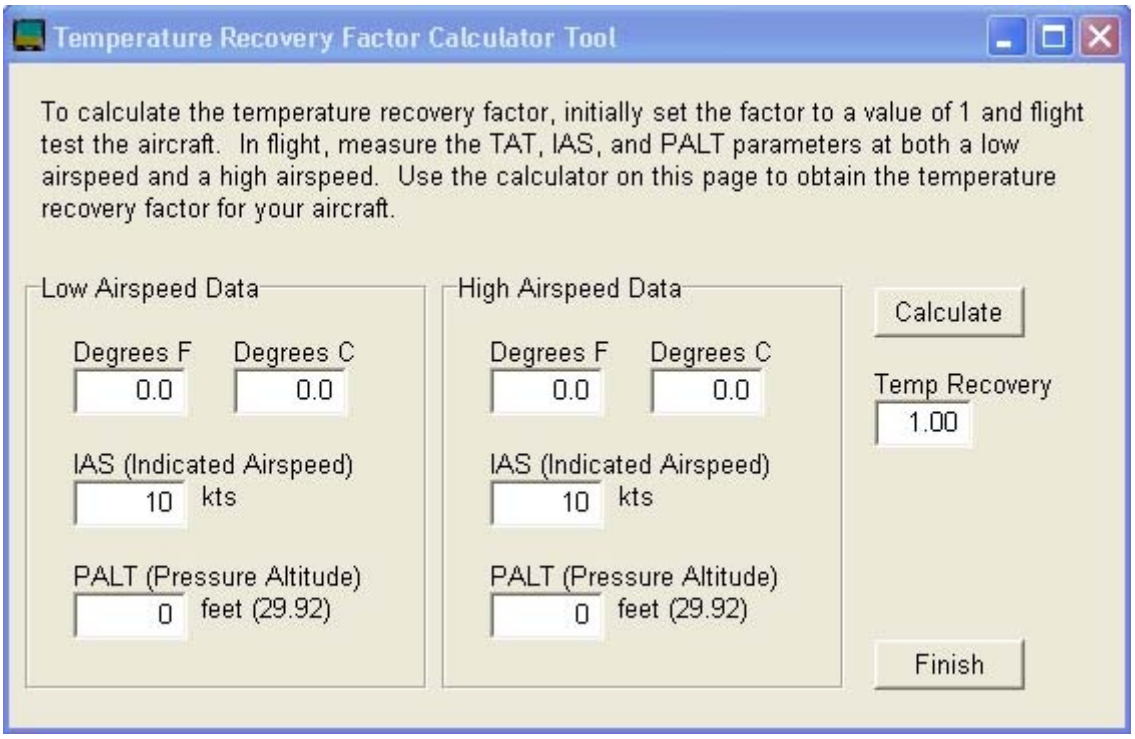
Analog Interface Unit - Used to indicate that an Analog Interface Unit has been installed in the aircraft. The Analog Interface Units is used to convert analog navigation signals to digital for the IDUs, and to convert digital autopilot commands to analog signals for interfacing with analog autopilots.

Misc Settings

Under Misc Settings, there are a number of general limitations that are set for the operation of the aircraft. These are:

Glide Ratio - This is the aircraft's engine-out glide ratio (forward distance traveled / altitude loss). The IDU uses this value to compute glide range on the ND.

Temp Recovery - This is the aircraft's temperature recovery factor. This factor is used to compensate for OAT sensing errors caused by compressibility of the air at the aircraft's OAT probe mounting location. This value is calculated by selecting the **Tools** menu and performing a test flight.



- The airspeeds to be flown will be the lowest safe airspeed without stalling and the highest safe airspeed without exceeding the limits of the aircraft.

- Test altitudes should be within 100 feet between low and high airspeeds.

- Only Centigrade or Fahrenheit need be recorded. The software will automatically convert the unchanged value.

- Proper values for Temp Recovery will be between 0.00 and 1.00. If the value is greater than 1.00, then the low and high speed temperature values have been reversed.

- After all collected values are inserted, press the *Calculate* button to perform the calculation

- When completed, press the *Finish* button to store the data in the correct location and exit the calculator tool. The window will disappear and the *Temp Recovery* value will be replaced with the value just calculated.

Path Quickening - The IDU uses this value to factor G-force into barometric vertical speed to derive an instantaneous vertical

speed. Instantaneous vertical speed is used along with ground speed to calculate the aircraft's climb or descent angle relative to the earth. Climb or descent angle is used to determine the position of the PFD flight path marker symbol. The greater this value, the more sensitive the instantaneous vertical speed calculation is to G-force.

GPS Antenna Offset - This value contains the GPS antenna vertical offset in feet.

Baro Units - This dropdown control selects the units of barometric pressure. Choices are inches of Mercury and millibars/hectoPascals.

Temperature Units - This dropdown control selects the units of temperature displayed on the IDU. Choices are degrees Fahrenheit and degrees Celsius.

Volume Units - This dropdown control selects the volume units used for displaying fuel quantity and flow on the IDU. Choices are:
Gallons
Liters
Pounds Gasoline
Pounds Jet Fuel
Kilograms Gasoline
Kilograms Jet Fuel

Fuel Low Alarm Level - This value determines the aircraft fuel quantity at which a low fuel alarm is issued. A low fuel alarm consists of a red "LOW FUEL" annunciation flag, and a repeating (until manually silenced) "FUEL LOW" voice annunciation. Units of measure are determined by the Volume Units selection.

Fuel Warning Level - This value determines the aircraft fuel quantity at which a low fuel warning is issued. A low fuel warning consists of a yellow "LOW FUEL" annunciation flag, and a single "FUEL LOW" voice annunciation. Units of measure are determined by the Volume Units selection.

Fuel Tank Full Level - This value is the total useable fuel quantity and is used for fuel totalizer functions. Units of measure are determined by the Volume Units selection.

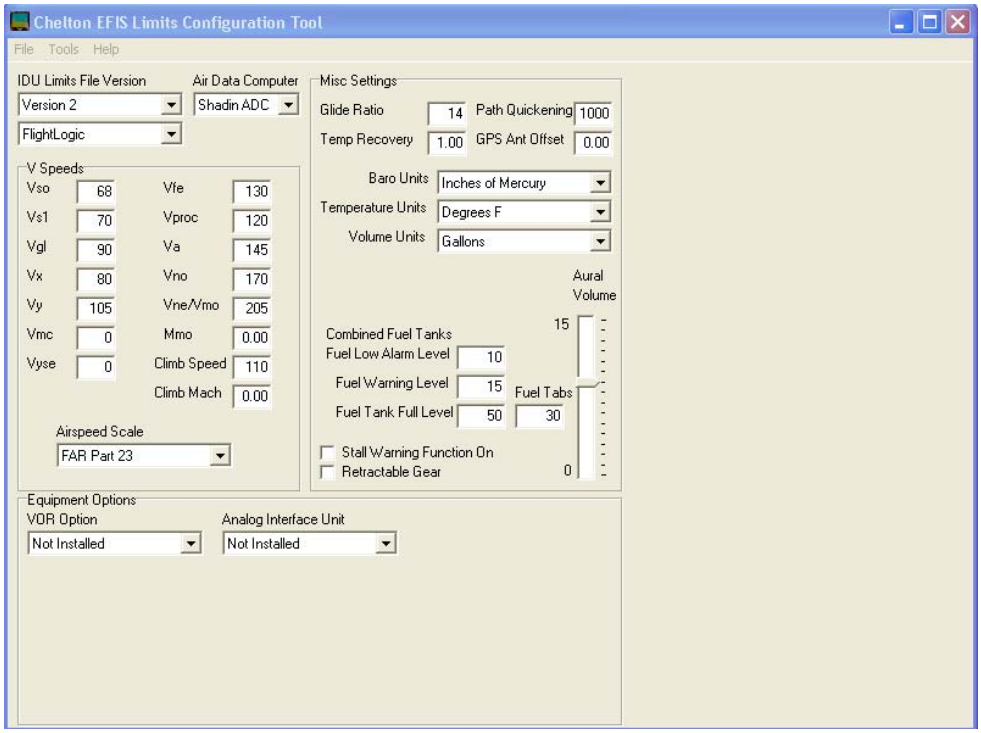
Fuel Tabs - This value is the total useable fuel quantity when filled to the tabs and is used for quick setting of the fuel level after refueling to the tabs (limits version 2). Units of measure is determined by the Volume Units selection.

Stall Warning Flag - When the Stall Warning Function On checkbox is not checked, the IDU stall warning function stall warning flag and stall warning voice annunciator are disabled. Note that low-speed awareness functions (pitch limit indicator, dynamic "Vs", and low-speed awareness "red arc") remain enabled regardless of the value of this flag. The purpose of this flag is to prevent conflicting alarms in aircraft with original equipment stall warning systems.

WARNING!
Deselect the Stall Warning Flag if the aircraft contains the original stall warning system to prevent conflicting alarms.

Retractable Gear - Indicates that the aircraft is equipped with retractable landing gear when checked.

Aural Volume – Adjusts the volume level of the EFIS aural annunciations and tones (limits version 2).



Compass Calibration

Preparation for Calibration

Position the aircraft a minimum of 250 feet away from any steel buildings, vehicles, or rebar-reinforced concrete. Perform the Compass Calibration with all engines running. Turn all electronic equipment and lights on that are normally on in flight.

Pre-installation Software Checkout

The GyroView software will be required to checkout the installation and calibrate the AHRS500GA-[]. It is recommended to install the software on the computer to be used for checkout and calibration before starting the procedure. A laptop computer running Microsoft Windows is recommended.

Install GyroView Software

To install GyroView in your computer:
1. Insert the CD "Support Tools" in the CD-ROM drive.
2. Find the GyroView folder. Double click on the setup file.
3. Follow the setup wizard instructions. You will install GyroView and a LabView Runtime Engine. You will need both these applications.

Maintenance/Calibration Cable Connections

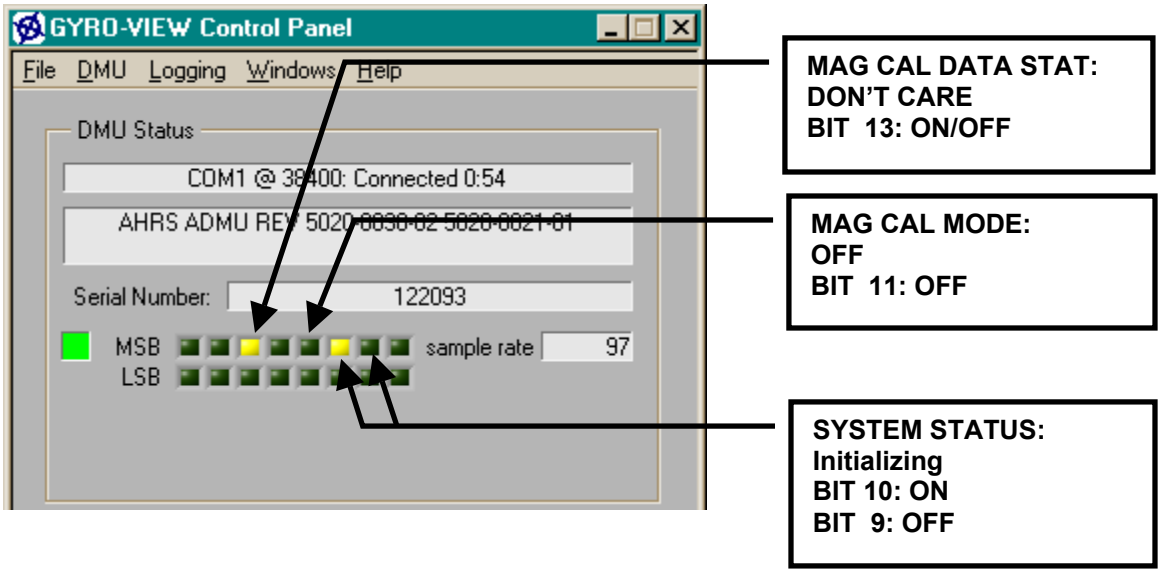
The AHRS500GA-[] is shipped with a maintenance/calibration cable to connect the unit to a PC communications port.
1. Connect the 15-pin female end of the digital signal cable to the port on the AHRS500GA-[].
2. Connect the 15-pin male end of the digital signal cable to the aircraft harness connector.
3. Connect the 9-pin end of the cable to the serial port of the computer.
4. The calibration switch on the cable should be set to OFF.
5. With the AHRS500GA-[] connected to your PC serial port and powered, open the GyroView software.
6. GyroView should automatically detect the AHRS500GA-[] and display the serial number and firmware version.

7. If GyroView does not connect, check that you have the correct COM port selected under the "DMU" menu.
8. Select the type of display you want under the menu item "Windows". Graph displays a real time graph of all the AHRS500GA-[] data; Navigation shows an artificial horizon display.
9. If the status indicator says, "Connected", you're ready to go. If the status indicator doesn't say connected, check the connections between the AHRS500GA-[] and the computer; check the power; check the serial COM port assignment on your computer.
10. Let the AHRS500GA-[] warm up for 60 seconds without any motion when first turned on. This allows the Kalman filter to estimate the rate sensor biases. Now you're ready to use the AHRS500GA-[].

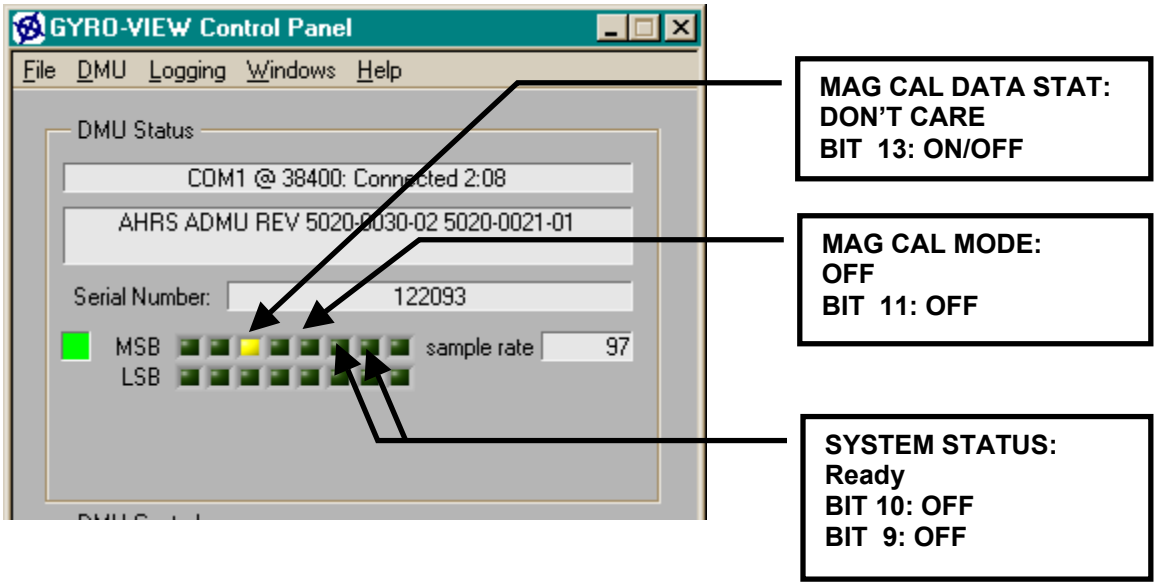
Calibration Process

The BIT status display in GyroView will be used to indicate the progress of the magnetometer compensation calibration. Four bits of the BIT status display are used for evaluating the hard iron calibration:

Bits 9 and 10 are a two bit field that shows the state of the AHRS500GA-[]
Bit 11 shows the mag cal mode
Bit 13 shows the mag calibration data status

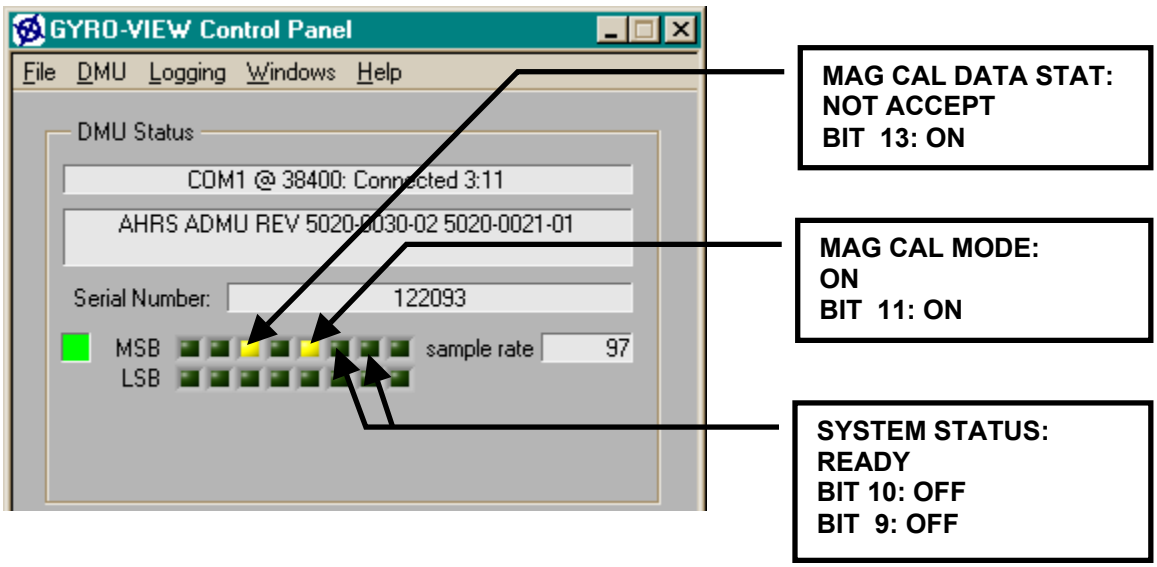


After approximately 60 seconds, the AHRS500GA-[] will complete the initialization mode and change to the ready mode. At this time, the following BIT status should be displayed:



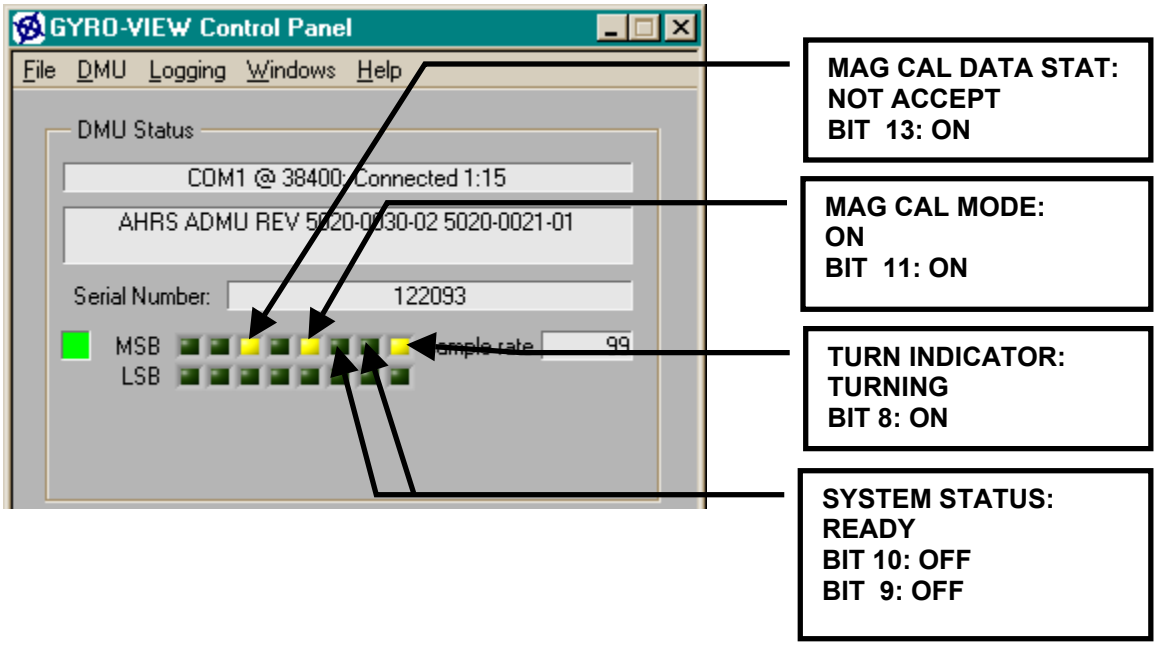
Switch to Mag Cal Mode:

Start the magnetic calibration by moving the calibration switch on the calibration/maintenance cable to the ON position. The AHRS500GA-[] will use all the subsequent measurements while the switch is in the ON position to model the magnetic environment. At this time, the following BIT status should be displayed:

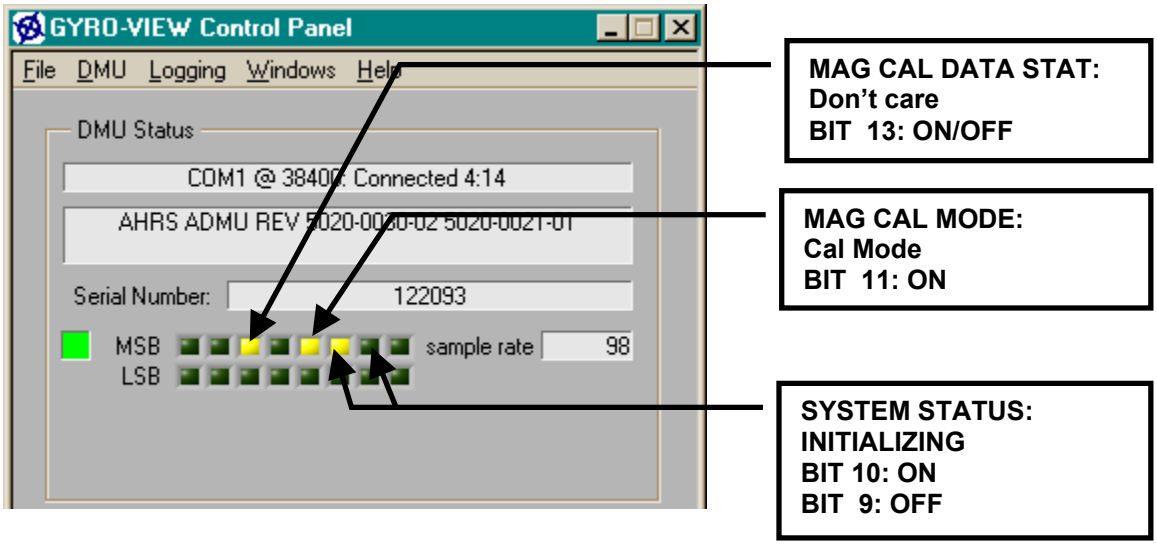


Collecting Calibration Data:

Make one complete turn, with the aircraft basically level on a taxiway, compass rose, etc. The AHRS500GA-[] monitors the data and calculates when a full turn is completed. At the completion of the full circle, the AHRS500GA-[] will reset itself into initialization mode and apply the estimated magnetometer calibration parameters. The turn indicator bit will come on while the AHRS500GA-[] is being moved through the turn and the GyroView BIT status panel will have the following appearance during the turn:

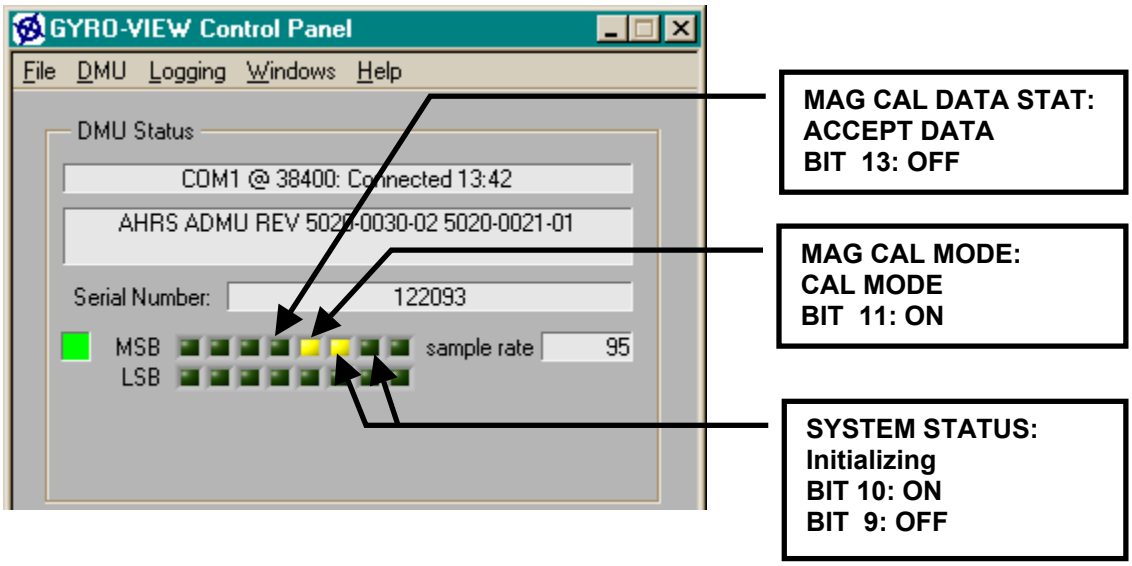


When the circle is completed, the following Gyroview BIT status should be displayed indicating the unit has made a full turn and is applying the estimated calibration. You should stop the rotation motion once the system status bits show the unit has reinitialized.



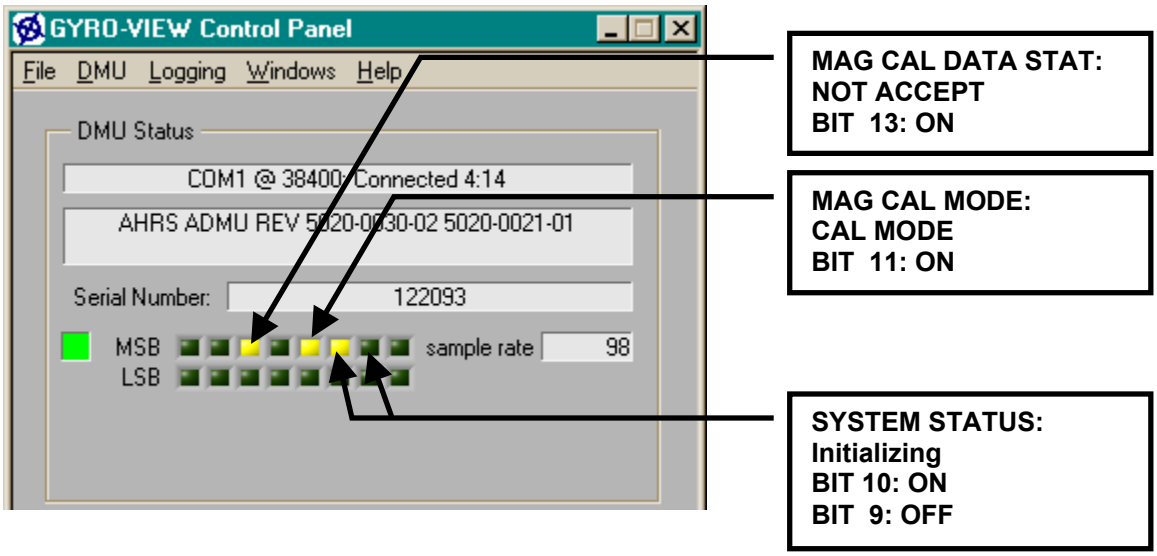
Evaluating Calibration Data:

At this point you should also monitor the Mag Cal Data Status bit 13 of the BIT word. If the magnetometer compensation is adequate, the following BIT status should be displayed:

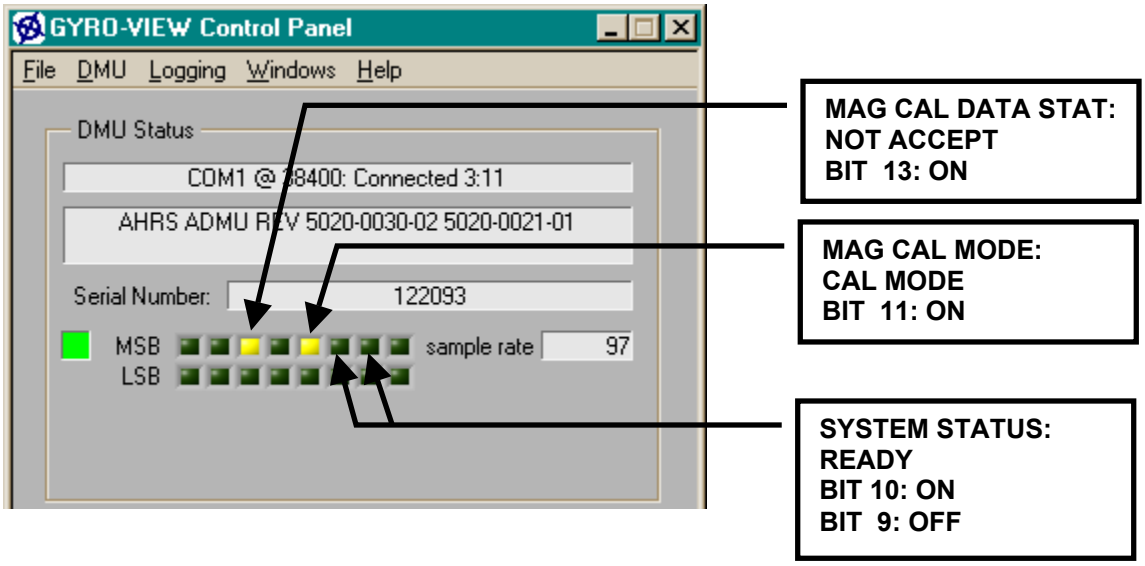


If the Mag Cal Data Status Bit is OFF as shown above, the data collected is adequate for the magnetometer calibration. No further aircraft motion is required. Proceed to the paragraph titled " Completing the Calibration."

If the magnetometer compensation data collection is not adequate, the mag cal data status bit (13) will still be ON and the following BIT status will be displayed:



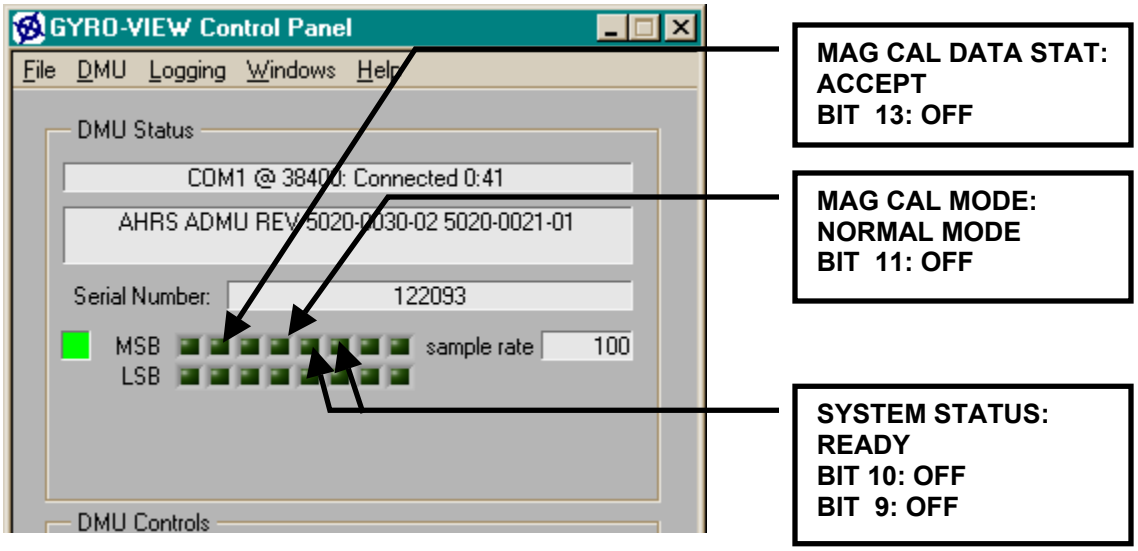
The Mag Cal Data Status Bit ON indicates that the compensation is not yet optimized and more calibration data needs to be collected. It won't usually signal a successful calibration after the first turn, unless the magnetic environment is extremely clean. Wait for the AHRS500GA-[] to complete its initialization. At the end of the initialization, approximately 60 seconds, the following BIT status should be displayed:



Repeat the "collecting calibration data" paragraph above, making another complete turn circle with the aircraft. Always turn the aircraft the same direction as the first turn. After the complete turn, the system will again reinitialize, and apply the latest estimates of the calibration parameters as described in the "Evaluating Calibration Data" paragraph. Continue repeating the cycle of turning the aircraft until initialization mode is indicated, looking at the mag cal data status bit for adequate data, and then waiting for the ready status (~60 seconds) before turning the aircraft again. In this way the calibration algorithm continues to refine itself until it achieves a successful calibration.

Completing the Calibration:

At this point, the AHRS500GA-[] has collected enough data for a good magnetometer compensation calibration. Move the calibration switch on the maintenance/calibration cable to the OFF position. The AHRS500GA-[] will now store these as calibration constants in the EEPROM for use upon subsequent power cycles. The GyroView BIT status display should look like:



Testing the Calibration:

The heading calibration can be tested by comparing the heading output of the AHRS500GA-[] with known reference (compass or compass markers).

Database Updates

Update Requirements

This section describes the procedures required to update the software and/or databases in the IDU. When an update is performed, the procedures will be performed on every IDU in the EFIS system separately. Scheduled updates are:

Navigation Database	Every 28 days
Obstruction Database	Every 56 days

Unscheduled or on-condition updates are:

EFIS Software
Terrain Database

EFIS Software Updates

EFIS system software changes become available when needed. The software can be obtained from Chelton Flight Systems either at their web site or by mail. When a software update of the EFIS is required, perform the following:

1. Remove power from the IDU to be updated.
2. Insert a SmartMedia card with the software program **update.exe** in the bottom of the IDU with the gold contacts up.
3. Insert a P/S-2 compatible keyboard in the keyboard connector.
4. Apply power to the IDU.
5. Follow the procedures for item “B” (Update) as described in the Ground Maintenance Functions earlier in this section.
6. When update is complete, remove power from the IDU, then remove the SmartMedia card.
7. Perform steps 1 thru 6 for each additional IDU in the aircraft.

Navigation Database Update

The Jeppesen navigation database is updated every 28 days. The database can be obtained from Chelton Flight Systems either at their web site or by mail. There are three types of navigation databases that can be used on the EFIS. These are:

Americas – Contains North, Central and South America
World – Contains major airports and navigation aids around the world
International – Contains the world database without the Americas

The database is loaded on each IDU by placing the program **navdata.exe** on a SmartMedia card. Perform the same steps as the EFIS software update described above.

Obstruction Database Update

The obstruction database is updated every 56 days. The availability of the obstruction database is determined by a government agency in each country. Not all countries have obstruction databases available.

The obstruction database can be obtained from Chelton Flight Systems at their web site or by mail. The database is loaded on each IDU by placing the program **obst.exe** on a SmartMedia card and follow the instructions outlined in the EFIS software update described above.

Terrain Database Update

The terrain database is updated on an as-needed basis. The database stored on an ATA type III PCMCIA card that can be accessed from the top of the IDU when removed from the rack. Due to the size of the database, the terrain cannot be updated through a SmartMedia card. When the terrain database requires updating, the following procedure is performed:

(1) Obtain an updated terrain database on an ATA card from Chelton Flight Systems.
(2) Remove the IDU from the rack.
(3) Remove the drive access cover located on top of the IDU.
(4) Press the eject button until the card extends above the IDU housing.
(5) Remove the old ATA card and insert the updated terrain database card in the same slot.
(6) Press the card in until the card is fully seated.
(7) Replace the drive access cover.
(8) Install the IDU in the rack.
(9) Apply power to the IDU and verify the change in the terrain database has been recognized.
(10) Repeat steps 1 thru 9 for each additional IDU in the aircraft.

Chapter 5

Ground Functional Test

1.0 PURPOSE OF TEST:

1.1 The procedures defined in this plan will demonstrate the proper operation of the EFIS System as installed on _____ aircraft.

2.0 TEST EQUIPMENT REQUIRED:

2.1 Pitot/Static Tester
Pilots Guide and Reference

3.0 EFIS System Wiring TEST:

		PASS	FAIL
3.1	Do not connect any equipment connectors until the following steps have been completed, prior to applying power to any system component.	_____	_____
3.2	Verify the wiring. Each wire should be continuity checked as indicated on drawing 702-045250 W/D EFIS IDU Interface in Chapter 3.	_____	_____
3.3	All shield wire, shielded twisted pairs and shielded twisted triple cable should be checked for shorts to the shield.	_____	_____
3.4	Apply aircraft 14 or 28 Volt DC power (as applicable). Place the EFIS Master Switch or Avionics Master to ON.		
	Verify that the proper voltage is on the proper pin only, in each connector and is controlled by the assigned circuit breaker.		

	No.1 PFD	Connector	9515-J1	Pins-D14, D15, E14, E15	_____ _____
	No.1 MFD	Connector	9525-J1	Pins-D14, D15, E14, E15	_____ _____
	ADC No. 1	Connector	P9511-2	Pin-1	_____ _____
	GPS No. 1	Connector	P9512-1	Pin-6	_____ _____
	AHRS No. 1	Connector	P9513-1	Pin-3	_____ _____
			Optional Equipment		
	No.2 MFD	Connector	9535-J1	Pins-D14, D15, E14, E15	_____ _____
	No.3 MFD	Connector	9545-J1	Pins-D14, D15, E14, E15	_____ _____
	ADC No. 2	Connector	P9521-1	Pin-1	_____ _____

					PASS	FAIL
	GPS No. 2	Connector	P9522-1	Pin-6	_____	_____
	AHRS No. 2	Connector	P9523-1	Pin-3	_____	_____
	AIU	Connector	P9514-1	Pins-1, 5	_____	_____

3.6 Place the EFIS Master switch or Avionics Master to OFF and remove aircraft 14 or 28V DC power. _____ _____

3.7 At this time install all IDU's and connect all source equipment connectors to their respective components. Push all related circuit breakers in. _____ _____

4.0 POWER UP EFIS SYSTEM TEST:

NOTE: Not all switches and circuit breakers specified below are installed in all aircraft configurations. Activate the switches and circuit breakers applicable. Steps not required should be marked N/A.
NOTE: The IDUs must be configured for applicable aircraft type prior to beginning the following test.

NOTE: GPS may take up to 30 minutes to acquire current satellite constellation upon initial operation.

4.1 Place the EFIS Master Switch or Avionics Master to the ON position. _____ _____

4.2 EFIS system will perform a self-test routine (approximately 45 seconds) and then display the PFD page. If any component signals are not being received, amber warning flags will display on the PFD. And the voice warning system will inform you which component signals are missing. _____ _____

4.5 Pull the #1 ADC circuit breaker and verify that the "NO AIR DATA" amber caution flag is visible on the PFD, with a single auditory annunciation. "AIR DATA FAILURE – AIR DATA FAILURE". _____ _____

4.6 Reset the #1 ADC circuit breaker and verify that the "NO AIR DATA" flag is removed within 90 seconds. _____ _____

4.7 If installed, select the #2 ADC then pull the #2 ADC circuit breaker. Verify that the "NO AIR DATA" amber caution flag is visible on the PFD, with a single auditory annunciation. "AIR DATA FAILURE – AIR DATA FAILURE". _____ _____

		PASS	FAIL
4.9	Pull the #1 GPS circuit breaker and verify that the "NO GPS" amber caution flag is visible on the PFD, with a single auditory annunciation "GPS FAILURE – GPS FAILURE."	_____	_____
4.10	Reset the #1 GPS circuit breaker and verify that the "NO GPS" flag is removed within 30 seconds.	_____	_____
4.11	If installed, select the #2 GPS then pull the #2 GPS circuit breaker. Verify that the "NO GPS" amber caution flag is visible on the PFD, with a single auditory annunciation. "GPS FAILURE. GPS FAILURE"	_____	____
4.12	Reset the #2 GPS circuit breaker and verify the "NO GPS" flag is removed within 30 seconds.	_____	_____
4.13	Pull the #1 AHRS circuit breaker and verify that the "NO ATTITUDE" amber caution flag is visible on the PFD, with a single auditory annunciation. "ATTITUDE FAILURE – ATTITUDE FAILURE."	_____	_____
4.14	Reset the #1 AHRS circuit breaker and verify the "NO ATTITUDE" flag is removed within 90 seconds.	_____	_____
4.15	If installed, select the #2 AHRS then pull the #2 AHRS circuit breaker. Verify that the "NO ATTITUDE" amber caution flag is visible on the PFD, with a single auditory annunciation. "ATTITUDE FAILURE – ATTITUDE FAILURE".	_____	____
4.16	Reset the #2 AHRS circuit breaker and verify the "NO ATTITUDE" flag is removed within 90 seconds.	_____	_____

5.0 ALTITUDE AND AIRSPEED TEST

5.1	IDU Indications and Warning NOTE: If dual ADC systems are installed, perform the following test on both pitot/static systems.		
5.1.1	Connect the pitot/static tester to the aircraft pitot and static system IA/W aircraft manufacturers' maintenance manual.	_____	_____
5.1.2	Select a barometric setting of 29.92 for the altimeter setting on the PFD, using the right-hand control knob on the bezel.	_____	_____

		PASS	FAIL
5.1.3	On the Pitot/Static tester select an airspeed of 100 Kts and an altitude of 1000 ft. AGL as displayed on the PFD. Approach the 1000 ft. altitude at a rate of 500 ft./min.	_____	_____
5.1.4	Verify the digital and analog reading of the airspeed, altitude and the vertical speed indications on the PFD are within tolerances of the test set.	_____	_____
5.1.5	Test ADC 1 and ADC 2 (if installed) per FAR Part 43 Appendix E Sec. E43.1(b)(i)	_____	_____
5.2	System Leak Test		
5.2.1	Test ADC 1 and ADC 2 (if installed) static system leak per FAR 43 Appendix E Sec. E43.1 (b)(ii)(iii)(v)(vi).	_____	_____
5.2.2	Test ADC1 and ADC2 (if installed) pitot system leak per aircraft maintenance manual.	_____	_____

6.0 No. 1 ATTITUDE TEST

6.1	Apply power to the aircraft and place the EFIS master switch to the "ON" position. The No. 1 AHRS performs a self-test and initialization routing. This routine takes up to ninety seconds from the time the unit receives full electrical power, during which the aircraft must remain stationary	_____	_____
6.2	Verify the attitude display and the aircraft deck angles agree in the roll & pitch axis of the aircraft.	_____	_____

7.0 No. 2 ATTITUDE TEST

7.1	Apply power to the aircraft and place the EFIS master switch to the "ON" position. The No. 2 AHRS performs a self-test and initialization routing. This routine takes up to ninety seconds from the time the unit receives full electrical power, during which the aircraft must remain stationary	_____	_____
7.2	Verify the attitude display and the aircraft deck angles agree in the roll & pitch axis of the aircraft.	_____	_____

8.0 AHRS COMPASS CALIBRATION

8.1	Perform a Compass Calibration for the No. 1 AHRS in accordance with Chapter 3, Compass Calibration.	_____	_____

		PASS	FAIL
8.2	If Installed, Perform a Compass Calibration for the No. 2 AHRS in accordance with Chapter 3, Compass Calibration.	_____	_____

9.0 No. 1 GPS TEST

9.1	Verify GPS 1 circuit breaker is set and observe that the "NO GPS" amber warning flag does not appear on the No. 1 PFD and MFD.	_____	____
9.2	Press the *MENU* button on the right-hand side of the No. 1 MFD. Select *FAULTS* on the menu. Observe that the following are displayed: GPS PWR OK GPS EQPMNT OK	_____	_____

10.0 No. 2 GPS TEST

10.1	If Installed, verify GPS 2 circuit breaker is set and observe that the "NO GPS" amber warning flag does not appear on the PFD and MFD when selected.	_____	____
10.2	Press the *MENU* button on the right-hand side of the No. 1 MFD. Select *FAULTS* on the menu. Observe that the following is displayed: GPS PWR OK GPS EQPMNT OK	_____	_____

11.0 Return aircraft to service per FAR 91.407(a).

Any "Fail" test items above shall be corrected and retested.

NOTE: Flight functional test required per FAR 91.470(b).

Chapter 6

Flight Functional Test

1.0 GENERAL

1.1 REFERENCE DOCUMENTS

Note: The following documents should be readily available during testing.

DOCUMENT	VENDOR	DOCUMENT NUMBER
PILOTS GUIDE	Chelton Flight Systems	150-045240

2.0 PURPOSE

2.1 To conduct a functional flight test, to evaluate / verify proper operation and accuracy of the multi-sensor, Chelton EFIS System, including operational functions, transfer functions, switching functions, and electrical bus switching, pertaining to the EFIS installation.

3.0	GPS TEST PROCEDURE	PASS	FAIL
3.1	Evaluate the accessibility and visibility of all controls, displays, and annunciators (Including Instrument Panel Switch / Annunciators), during day and night lighting conditions. No distracting cockpit glare or reflections may be introduced, and all controls must be illuminated for identification and ease of use. Night lighting shall be consistent with other cockpit lighting.	_____	_____
3.2	Evaluate all operating modes with particular attention being paid to mode switching and transition requirements.	_____	_____
3.3	If EFIS system is connected to the autopilot (optional), evaluate steering response of autopilot, including during power system failures.	_____	_____
3.4	Evaluate all switching and transfer functions, including electrical bus switching pertaining to EFIS system.	_____	_____
3.5	Verify continuity of navigation data during 360 degree left and right turns at 30 degrees of bank for each AHRS installed on aircraft.	_____	_____

		PASS	FAIL
3.6	Monitor display guidance for en-route and approach operations to verify FTE is less than 1.0 nmi (en-route and approach transition) and 0.25 nmi. (Approach), both with and without the use of autopilot (if interfaced). FTE (Flight Technical Error) may be observed by navigating to a known waypoint such as a runway threshold or a VOR. Fly the airplane as "on course" as possible using the deviation displays. Visually confirm that the waypoint is within the allowable limits for FTE as stated above for each GPS receiver installed on aircraft.	_____	_____
3.8	Validate navigation system accuracy by low altitude over-flights (2) of one or more survey locations (ensure survey point coordinates are relative to WGS-84 or NAD-83). An acceptable method of conducting this accuracy demonstration is to accomplish low-altitude (less than 100 feet AGL) over-flight of a runway threshold and record the GPS position as the aircraft crosses the threshold. The system accuracy is the distance between the coordinate position determined by the GPS and the coordinate position of the surveyed location (runway threshold). Runway threshold coordinates may be obtained by the airport operator. If coordinate data conversions to WGS-84 / NAD-83 is necessary, contact the national Flight Data Center at 202-267-9277 for each GPS receiver installed on aircraft.	_____	_____
3.9	Conduct a sufficient number of approaches using the navigation database to verify proper operation of annunciations, waypoint sequencing, and display sensitivity changes, as appropriate, in accordance with TSO. This evaluation should include at least: turn anticipation, waypoint sequencing, display sensitivity changes, annunciations, procedure turns at the final approach fix (FAF), holding patterns at the missed approach holding fix, transitions from TO-FROM operation to TO-TO operation, heading legs after the initial approach fix (IAF) to intercept the final approach course both before and after the FAF, and DIRECT-TO operation before and after the IAF. Conduct at least three published instrument approaches (retrieved from the database) to verify proper operation of the equipment in the approach environment for each GPS receiver installed on aircraft.	_____	_____

		PASS	FAIL
3.10	Evaluate crew workload during operation.	_____	_____
3.11	Evaluate the electromagnetic compatibility (EMC) between the EFIS system and other on board equipment to ensure there are no adverse affects to this equipment, or other equipment does not adversely affect the EFIS system.	_____	_____
	Note: Particular attention should be given to other "L" band equipment, such as WAS or Satcom equipment, VHF transmissions on frequencies 121.150, 121.175, 121.200, 131.250, 131.275, and 131.300. High Frequency (HF) communications systems, and other transmitting equipment (ACARS, AFIS, Flightfone, etc.)		

4.0 OAT COMPRESSIBILITY TEST

4.1	Maneuver the aircraft to a safe altitude away from other traffic. Hold the aircraft at a constant altitude and direction throughout the test.	
4.2	Reduce airspeed as low as possible and maintain altitude without stalling the aircraft. Record the following:	
	OAT (°F)	_____
	IAS (KTS)	_____
4.3	Increase airspeed as high as possible wail maintaining altitude without exceeding maximum airspeed. Record the following:	
	OAT (°F)	_____
	IAS (KTS)	_____
4.4	End of Flight Functional Test.	
	Document completion of Flight Functional Test I/A/W FAR 91.407(b)	

5.0 OAT PROGRAMMING

5.1	Run IDU Limits program on a computer with a SmartMedia card reader/writer attached.	

5.2 Insert the values from steps 4.2 and 4.3 into Low and High value boxes.

5.3 Save the limits file to the SmartMedia card.

5.4 Insert the SmartMedia card in the PFD (No1 IDU).

5.5 Apply power to the IDU and verify Ground Maintenance menu is active.

5.6 Select item “B” to update the new value of the OAT compressibility factor.

5.7 Upon completion of the update, remove power from the IDU and remove the SmartMedia card.